United States
Environmental Protection Agency
Office of Transportation and Air Quality
National Vehicle and Fuel Emissions Laboratory
2565 Plymouth Road
Ann Arbor, MI 48105

Electric Dynamometer Sample Collection and Exhaust Measurement Procedure

This procedure is written for the Environmental Protection Agency, National Vehicle and Fuel Emissions Laboratory (NVFEL) internal use. The use of specific brand names by NVFEL in this procedure are for reference only and are not an endorsement of those products. This document may be used for guidance by other laboratories.

NVFEL Reference Number

732

Implementation Approval

Original Procedure Authorized by EPCN 385 on 09-30-2004

Revision Description

Table of Contents

Attachments

1. Purpose

The purpose of this procedure is to document the National Vehicle and Fuel Emissions Laboratory (NVFEL) sample collection of the gaseous emissions in the exhaust of gasoline-fueled vehicles during the Federal Test Procedure (FTP) or the Highway Fuel Economy Test (HFET) using the Horiba Automatic Emission Analysis System.

Unless otherwise specified, the driver is responsible for completing the steps in this procedure.

2. Test Article Description

Light-duty vehicles scheduled for Certification, Fuel Economy, Enforcement, or other testing.

3. References

3.1 "Code of Federal Regulations," Title 40, Part 86, Subpart A, Section 86.082, and Subpart B, Sections 86.105, 86.106, 86.107, 86.108, 86.109, 86.111, 86.113, 86.114, 86.115, 86.116, 86.121, 86.122, 86.123, 86.124, 86.125, 86.126, 86.127, 86.128, 86.129, 86.130, 86.135, 86.136, 86.137, 86.140, 86.142, 86.144 and Appendix I

Part 600 Subpart B, Sections 600.106, 600.109, 600.110, 600.111, and Appendix I

3.2 Environmental Protection Agency (EPA) Test Procedure, TP 703

All references include procedures referenced and all subsequent revisions thereof.

3.3 See NVFEL 703 for the 48" single-roll electric dynamometer power start-up and power shutdown procedures.

3.4 "ASTM Rounding Off Procedure," July 15, 1990

3.5 NVFEL current safety policies

3.6 Horiba Constant Volume Sampler Operation Manual

3.7 Horiba Chassis Dynamometer Test Control System (CDTCS) Manual

3.8 Horiba MEXA 7000 Series Training Manual

3.9 Horiba Series 7000 User Guide

3.10 NEFF Instrument Corporation System 470 Operation and Maintenance Manual

4. Required Equipment

4.1 Form 700-03, "Preconditioning and Sample Collection" Attachment A

4.2 Form 902-01, "Test Status Report"

4.3 Video Driver's Aid (VDA) System:

4.3.1 Data Acquisition Microcomputer

4.3.2 Video Monitor

4.3.3 Data Acquisition Device

4.3.4 Laboratory Network System (LNS)

4.3.5 Network Printers

4.4 48" single-roll electric dynamometer and data acquisition equipment:

Equipment used: Horiba LDV-48-86-125HP-AC Single Roll 48-Inch Electric Dynamometer with:

CDC-900 Computerized Dynamometer Controller

RTM-200 Real-Time Monitor Computer

CTM250G Microterminal

Power Converter, Power Exchange Unit (PEU), torque measuring system, and speed measuring system

4.5 48" single-roll electric dynamometer, wheel chock assembly

Equipment used: Single-roll dynamometer wheel chock assembly, fabricated per EOD requirements

4.6 Exhaust Connectors:

4.6.1 Flexible exhaust tubes

4.6.2 Exhaust tube adapters

4.6.3 Clamps

4.6.4 Gaskets and boot assembly

Equipment used: All the above are fabricated to meet requirements; see blueprint file drawings TO4 88B-(0-11).

4.7 Horiba MEXA 7200 Exhaust Gas Analyzers

4.8 Horiba Constant Volume Sampler

4.9 Compressed air supply with air hose, tire inflation chuck, and calibrated pressure gauge

4.10 Fixed-speed cooling fan with a capacity not exceeding 5,300 cubic feet per minute (cfm). Additional or special cooling fans may be used if approved in advance by Certification Division or the appropriate Task Officer.

Equipment used: Hartzell Fan Model #N24-DUWS

4.11 Test Cell Ambient monitoring system:

4.11.1 Type "J" thermocouple and temperature/millivolt transmitter, or thermocouple thermometer connected to a strip chart recorder

4.11.2 Dew-Point Hygrometer located in the test cell.

5. Precautions

5.1 For the FTP, the vehicle's ignition key must remain in the "Off" position until the start of the test. Turning the ignition to "On" can affect the engine fuel system.

5.2 For the FTP, the vehicle's windows must remain down during the 12- to 36-hour soak period on those vehicles equipped with power windows, since turning the key to the "On" position before the test may affect the fuel system.

5.3 The dynamometer must be warmed up before use.

5.4 The driver must not use the test vehicle brakes and accelerator simultaneously; therefore, brakes and accelerator must be operated sequentially using the same foot.

5.5 The restraint system that secures the test vehicle on the 48" single-roll electric dynamometer must be adjusted to position the vehicleís drive wheels approximately at the roll surface crown.

5.6 When the test vehicle is connected to the CVS, care must be taken to avoid putting excessive strain on the vehicle's exhaust system. The CVS blower must be operating when the vehicle's engine is running.

5.7 The exhaust scrubber system (accessed through the test cell floor) must be on and operating properly**.**

5.8 The vehicle starting procedures must be with the vehicle.

5.9 The test cell door(s) must be closed before starting the vehicle engine and while it is operated on a dynamometer.

5.10 The driver must remain inside the vehicle in the proper driving position at all times while it is being operated on the dynamometer.

5.11 The test vehicle must be correctly aligned on the dynamometer prior to testing.

5.12 The 48" single-roll electric dynamometer contact must be engaged and the "RUN MODE" must be selected before driving the test vehicle.

5.13 The 48" single-roll electric dynamometer contact must be disengaged before removing the test vehicle.

5.14 Personnel in the test cell should avoid close proximity to the test vehicle when the 48" single-roll electric dynamometer roll cradle is raised or lowered.

5.15 The Horiba CVS control must always be in the "local" mode and the GPIB must be "ON" for automatic computer operation.

5.16 If the Horiba Analysis System power is completely shut down, the correct start-up procedure for system must be followed. See Attachment B for details.

5.17 The test can be aborted at anytime by clicking on the "Abort" button displayed on the CDTCS.

5.18 A CDTCS leak check must be performed prior to testing each day.

6. Visual Inspection

6.1 Inspect the boots, gaskets, and connecting pipes used between the vehicle and the CVS for leaks.

6.2 Inspect the 48" single-roll electric dynamometer and ensure that the contact is engaged and the "RUN MODE" is selected before driving the test vehicle.

6.3 Verify that the power for all of the Horiba Analysis System components are on. If it is not, see Attachment B for details on the startup procedure.

7. Test Article Preparation

If at anytime the test sequence needs to be aborted, click on the "Abort" button. If the test schedule aborts and you to can not make another selection, a display window may be behind another window, waiting for more information. To see, scroll through the windows, hold down the <ALT> and then the <Tab> until you see the window you need and enter the data. The schedule will then abort and allow other selections.

If this is the first test of the day on a 48" single-roll electric dynamometer, a dyno warm-up procedure must be performed, followed by an automatic calibration procedure and if necessary, a parasitic loss calibration.

For the FTP, the vehicle must have been preconditioned by operation on chassis dynamometer through one cycle of the "EPA Urban Dynamometer Driving Schedule" (see NVFEL 703). This must be followed by a 12-36 hour soak, refueling, and if required per CFR 86.130, canister preconditioning.

The HFET is designed to be performed immediately following the FTP. In the event the test cannot be scheduled within 3 hours, which may include a 1-hour hot-soak evaporation loss test, the vehicle must be preconditioned (NVFEL 703). If the vehicle has been moved outdoors, or to environments where the soak temperature is not controlled, it must be soaked at 68-86 ^{o}F for a minimum of 4 hours prior to performing the preconditioning UDDS in order to properly set tire pressure.

Unless otherwise indicated, the driver is responsible for ensuring that the following preparatory steps are performed.

7.1 On Form 730-03, verify that the Vehicle ID # and Test Number are correct.

7.2 The following steps are done only at the start of each day.

7.2.1 Print the CYSITE SPCN report and verify that all the bottle names match the names posted on each Horiba site in the control room. If not, the span point must be updated. See Attachment C for details.

If there are no changes, put your ID# and date on the report. Replace the old report with the new report.

7.2.2 Verify that the CVS is in local mode and that the GPIB="ON." If the GPIB ="OFF" push the "System" button on the CVS front panel. Push "3" for the "CNTL" screen then push "1" to put the GPIB ="ON."

The MEXA bench must be in the on-line mode. If it is not, click on the "OFFLINE" button (upper right corner) and it will change to "ONLINE."

7.2.3 Verify that all SHS filters are clean and installed correctly. See Attachment D for details.

7.2.4 On the CDTCS, under the "Testrun" menu item select "Test Schedules" and select "LeakCheckBags." Each bag, one at a time, will be evacuated until a vacuum of 20 inches of mercury is obtained. Then the leak check will last for 1 minute. If any bag fails, see senior technician for instructions on manual checking of that bag. If the leak check fails again, the bag must be replaced and the new bag leak checked before proceeding.

Note: The dyno warm-up procedure should begin during the bag leak check process.

7.3 Enter the required VDA information and push <Command-S>. If needed, see Attachment E for details on entering required information.

7.4 Approximately 10 minutes before the test is to begin, notify the manufacturer's representative. If a representative cannot be reached within 10 minutes, begin the test. The test may be delayed for 5 additional minutes if the representative is observing a test on another dynamometer, providing the other time constraints are not violated.

7.5 Ensure that the test cell air handling system is operating and in the "Test" position and power is applied to the dew-point hygrometer. Fuel Economy Data Vehicles only: The dry-bulb temperature should be 75 ±2 ^{o}F and the humidity controller should be set such that the dew-point hygrometer reads 45-50 ^{o}F (the target is 47.5 ^{o}F) at the start of the test. The dew-point hygrometer flow setting must be 2.0 standard cubic feet per hour (scfh).

If the dew-point reading is outside the range of 42-52 ^{o}F at any point during the test, adjust the humidity controller slightly as needed to return the dew-point to the 45-50 ^{o}F range. If the dry-bulb temperature or dew-point is not within its respective limits, notify the senior technician and/or the Building Service Contractor.

See Attachment F, "Specific Humidity Specifications Range For Fuel Economy Tests" for a chart showing the dew-point endpoints.

If the dew-point exceeds these tolerances, use the dew-point and barometer values from TAP and calculate the specific humidity using the Excel™ "Humidity Calc. 3.0" program. Ensure the specific humidity is 30-70 gr./lb.

7.6 The following steps describe the prep sequence for the 48" single-roll electric dynamometer and are performed using the RTM-200 computer, keyboard, and monitor located in the test site control room. The symbols < > are used to indicate a key on the computer keyboard.

Example: Push <1> to start. This means that you need to push the key labeled "1" to start the device.

Comments may be entered during warm-up, automatic calibration, and parasitic loss calibration after pressing <F2>.

If it is not, the test is void. See Attachment G for a flow diagram of this process.

Note: For 48" single-roll electric dyno power start-up and power shutdown procedures, see NVFEL 703, Sections 7 and 8.

Note: The dyno may be warmed with the test vehicle if a preconditioning LA-4 is required for the HFET. The test vehicle can not be used to verify the horsepower.

7.6.1 Select "Warm Up" from the "DYNAMOMETER MAIN MENU" screen. The screen will appear in the setup mode.

If warning messages are displayed, address the warnings, see "Horiba Dynamometer Operations Manual."

7.6.2 Look at the monitor screen and ensure the following:

"BRAKE" is "OFF" by pressing <F4>

"CRADLE" is "DOWN" by pressing <F6>

"COVER " is "ON" by pressing <F5>

7.6.3 Start the dyno warm-up by pressing <F1>. After approximately 5.5 minutes, the message "DYNO IS WARM" will appear at the top of the screen.

If a message other than "DYNO IS WARM" appears, contact the senior technician.

7.6.4 Return to the setup mode of the "WARM UP" screen by pressing <F1>.

7.6.5 Stop the rolls by pressing <F8>, then <Enter>.

7.6.6 Record the time at the end of the warm-up on Form 700-03.

7.6.7 If the automatic calibration procedure has already been performed for the day, go to Step 7.7. An automatic calibration procedure must be performed on a 48" single-roll electric dynamometer following the first warm-up procedure of each day.

7.6.8 From the "DYNAMOMETER MAIN MENU" screen, select "Automatic Calibration." The "AUTOMATIC CALIBRATION" screen will appear in the setup mode.

7.6.9 Start the calibration by Pressing <F1>. Measurements will be automatically taken at the "OFFSET READING SPEED" of 5 mph. Upon completion, the message "Test Done" will appear on the screen. Press <F1> to return to the setup mode.

7.6.10 Look at the "Change" row. The value under "OFFSET" should be less than 0.5 pounds.

7.6.11 If the "OFFSET" is less than 0.5 pounds:

Press <F1> to return to the setup mode.

Press <N> in response to the prompt "USE THESE VALUES NOW? (Y/N)."

If the "OFFSET" value was not updated, go to Step 7.7.

7.6.12 If the change in the "OFFSET" is more than 0.5 pounds:

Update the values by pressing <Y> in response to the prompt "USE THESE VALUES NOW? (Y/N)."

Print the "AUTOMATIC CALIBRATION" screen data by simultaneously pressing <Alt> and <P>. Forward the printout to the senior technician.

Exit the setup mode by pressing <F1>. The dyno will automatically rerun the automatic calibration.

If the change in the "OFFSET" is more than 0.5 pounds after rerunning the automatic calibration, print the "AUTOMATIC CALIBRATION" screen data by simultaneously pressing <Alt> and <P> and stop pending determination of the dyno status by the senior technician.

If the "OFFSET" value shows a change of more than 0.5 pounds after completion of the 5 mph reading, the automatic calibration may be stopped manually, the new "OFFSET" values updated, and the "AUTOMATIC CALIBRATION" screen data printed. This allows the automatic calibration to be rerun before the "SHUNT" checks are completed and permits adjustment of the "OFFSET" values without affecting the "+SHUNT" and "-SHUNT" values.

If the "OFFSET" value was updated, print the "AUTOMATIC CALIBRATION" screen data by simultaneously pressing <Alt> and <P> and forward the printout to the senior technician. A Parasitic Loss Calibration procedure must be performed.

7.6.13 From the "DYNAMOMETER MAIN MENU" screen, select the "Parasitic Losses" screen. The "PARASITIC LOSSES" screen will appear in the setup mode.

7.6.14 Ensure that the proper speed points are displayed in the data table at the right of the screen. The speed points are 5-80 mph in increments of 5 mph unless otherwise specified by the test requester.

7.6.15 Ensure the following:

"BRAKE" is "OFF" by pressing <F4>

"CRADLE" is "DOWN" by pressing <F6>

"COVER" is "ON" by pressing <F5>

7.6.16 Exit the setup mode and start the parasitic losses calibration, by pressing <F1>. When the calibration is complete, the prompt "TEST DONE" will appear on the screen and the dyno will automatically decelerate to a 50-mph warm-up speed.

7.6.17 Return to the setup mode by pressing <F1>. The prompt "USE THIS NEW LOSSES CURVE? (Y/N)" will be displayed on the screen.

7.6.18 Look under the "Change LBS" column. The value at any corresponding speed point should not exceed 1.0 lb and the "CURVE FIT r^2" value (lower center of the screen) should be 0.996 or greater.

If the change in parasitic loss at any speed point does not exceed 1.0 lb for the corresponding speed points in the "Change LBS" column and the "CURVE FIT r^2" value is 0.996 or greater, press <N>. The loss curve will be saved in the archives and the dynamometer will return to the setup mode.

If the "CURVE FIT r^2" value is less than 0.996:

Press <Y>. in response to the screen prompt "USE THIS NEW LOSSES CURVE? (Y/N)." The loss curve will be saved in the archives, and the dynamometer will return to the setup mode.

Rerun the parasitic losses calibration by pressing <F1>. If the "CURVE FIT r^2" value is less than 0.996 again, stop the dyno prep pending determination of the dyno status by the senior technician. Print the "PARASITIC LOSSES" screen data by pressing <Alt> and <P> and forward the report to the senior technician.

If the change in parasitic loss at any speed point exceeds 1.0 lb, indicated by an asterisk alongside the corresponding speed point in the "Change LBS" column, and if the "CURVE FIT r^2" value is 0.996 or greater:

Press <Y>. in response to the screen prompt "USE THIS NEW LOSSES CURVE? (Y/N)." The loss curve will be saved in the archives, and the dynamometer will return to the setup mode.

Print the "PARASITIC LOSSES" screen data by pressing <Alt> and <P> and forward the report to the senior technician.

7.6.19 Stop the dynamometer by pressing <F8> followed by <Enter>.

7.6.20 Print the Horiba Electric Dynamometer "PARASITIC LOSSES" report. See Attachment H for an example of the report.

7.6.21 On Form 700-03, record the warm-up end time in the "Last dyno usage time:" area.

7.7 The following steps describe Pre-Test Processing and are performed on the WindowsNT computer.

7.7.1 Double-click the "Pre Test Processing" icon. See the arrow in Figure 1.

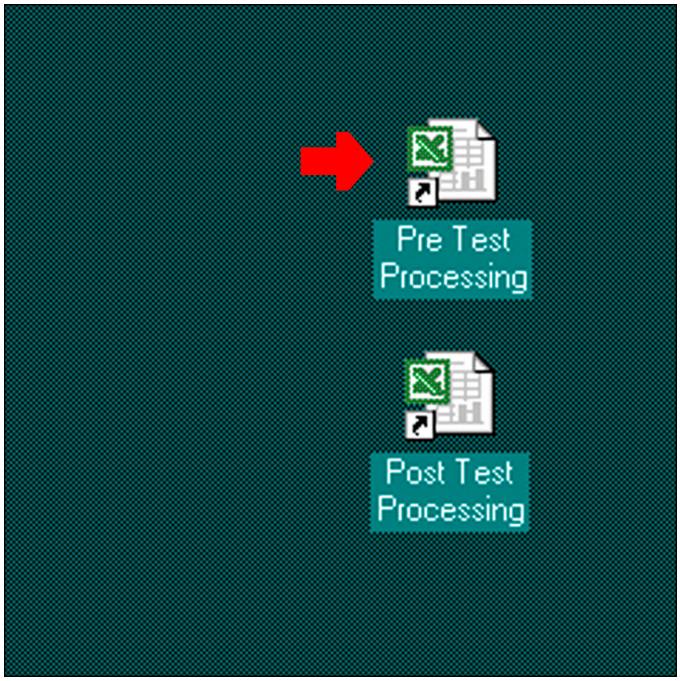


Figure 1

7.7.2 A dialog box appears on the screen to Enter User Name and Password, enter the required information.

7.7.3 When the next dialog box appears, click on "Enable Macros."

7.7.4 On the "Schedule Vehicle Tests" screen, click on the "Select Test Number and Move it to Site" button. See the arrow in Figure 2.

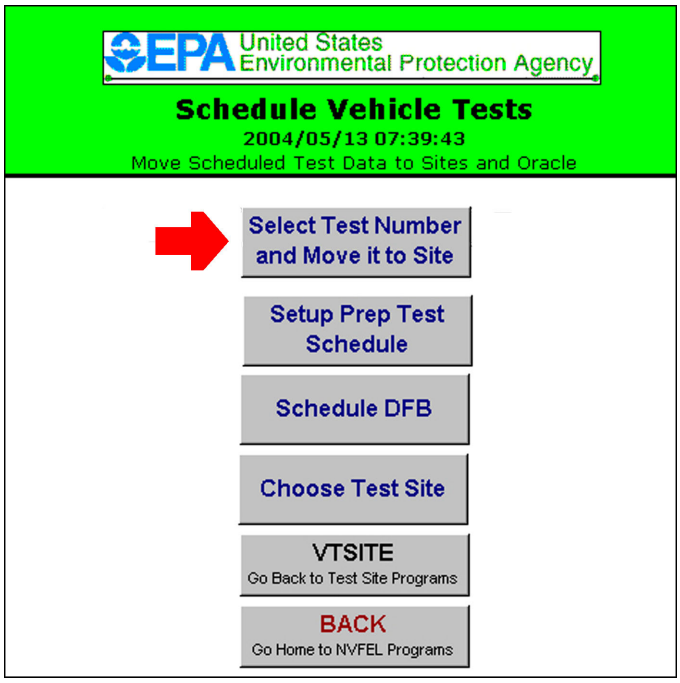


Figure 2

7.7.5 On the "Select Test Number" screen, click on the arrow next to "Scheduled Tests" and locate the test number to be transferred by scrolling through the drop-down list. Double-click on the selected test number. See the arrow in Figure 3.

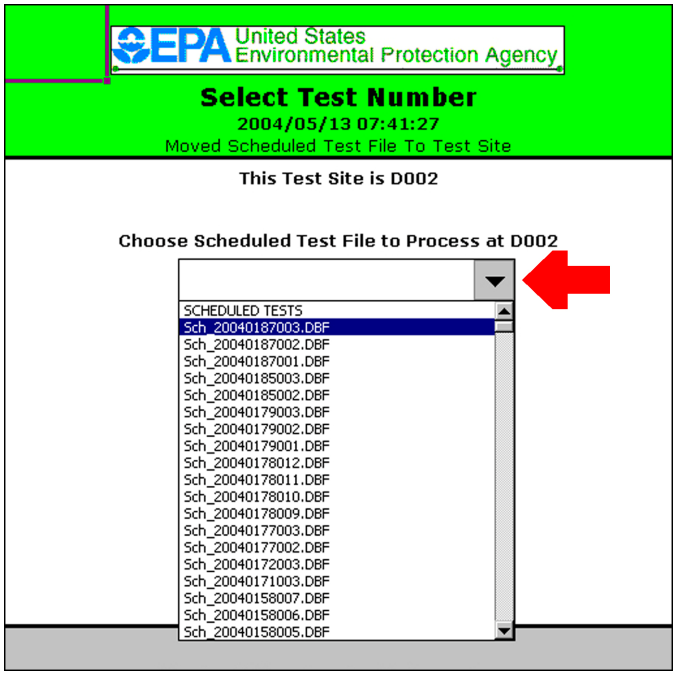


Figure 3

7.7.6 On the "CHOOSE CVS FLOW RATE" screen; ensure the correct cubic feet per meter (CFM) rate is selected for the test.

Ensure that the box next to "Sample Emissions with Bag Mini Diluter?" label contains a check mark if the Bag Mini Diluter is being used. See the arrow in Figure 4.

If the Bag Mini Diluter is not being used ensure the box does not contain a check mark. Click on the "Apply" button.

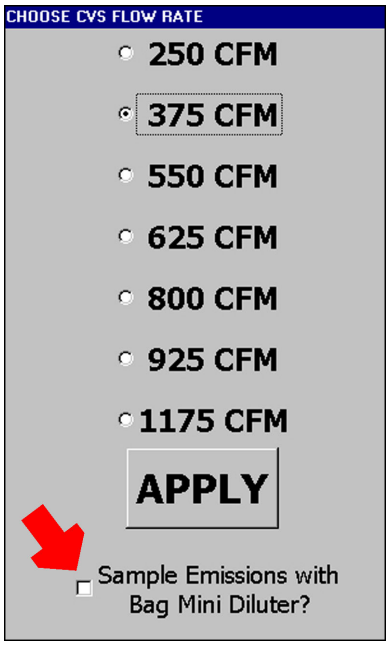


Figure 4

7.7.7 When "P_XXXXXXXXXXX.txt WAS SAVED ON DOOY COMPUTER" (where "P_XXXXXXXXXXX.txt" is the test number and "DOOY" is the Dyno number) appears, click on "OK." See the arrow in Figure 5.

Figure 5

7.7.8 Click "OK" on the "Test was Saved" screen.

7.8 Verify that the test number has been entered on the VDA and the <Command-S> keys have been pushed.

7.9 On the CDTCS computer, under the "Run" menu item select "Test Schedules."

See the arrow in Figure 6.

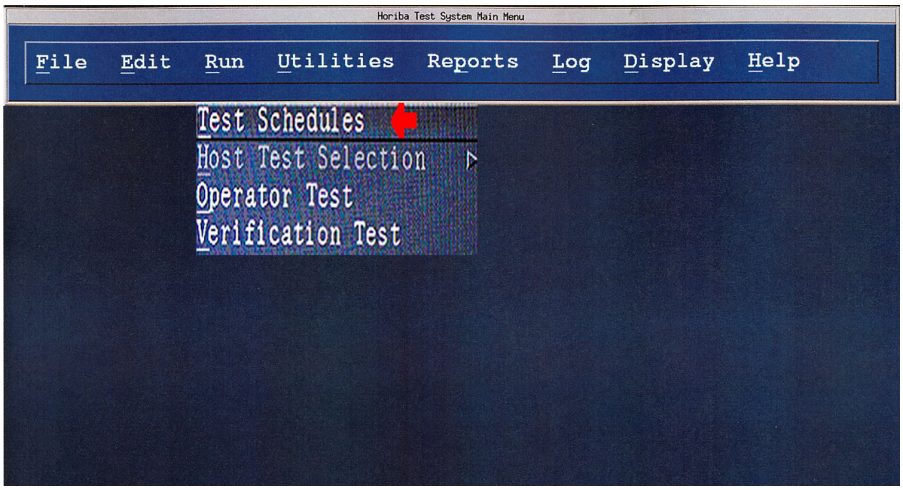


Figure 6

7.9.1 On the "Test Schedule File Selection Dialog" screen, in the "Files" section select "EPAVDAEmission Test" (arrow 1 in Figure 7)

Click on the "Run Test" button (arrow 2 in Figure 7).

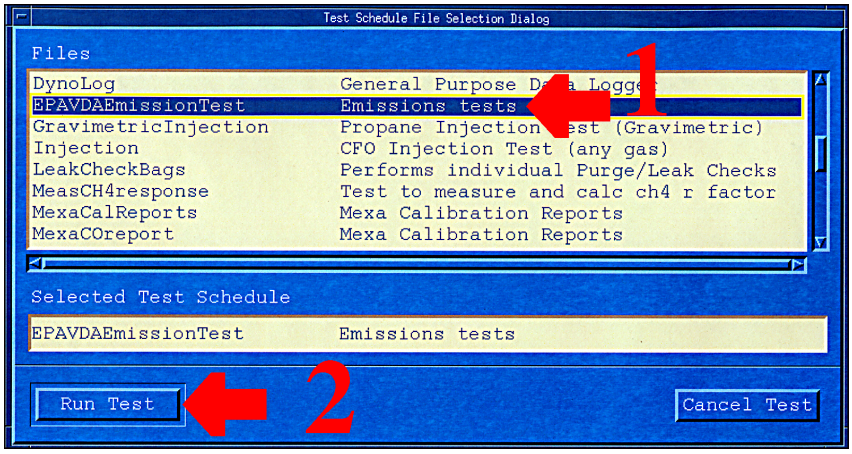


Figure 7

7.9.2 On the "AnswerFile.vi" screen, select the answer file (P_19990076169.txt or P_20040001132.txt as examples) that corresponds to the test number for the vehicle to be tested. See Figure 8.

Click on the "OK" button.

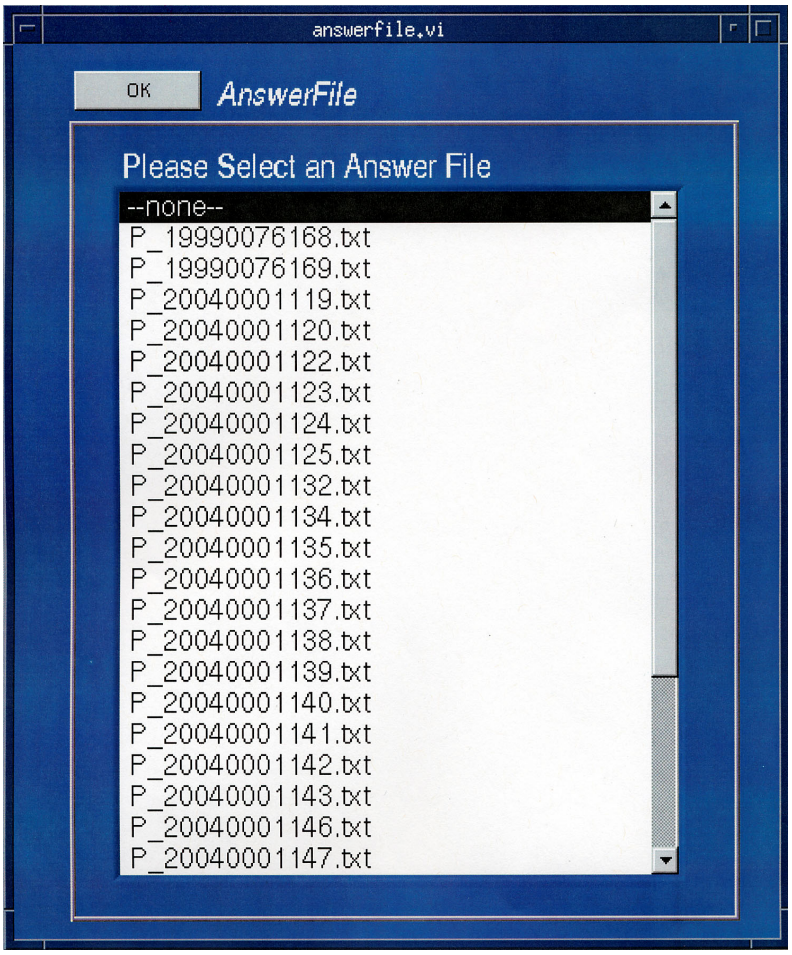


Figure 8

7.9.3 On the "testoptions.vi" screen, ensure that:

The "Measure Emissions" button is selected green (arrow 1 in Figure 9)

The correct "Test Type" selection is highlighted (arrow 2 in Figure 9)

The correct "CVS Flow Rate" selection is highlighted (arrow 3 in Figure 9)

The correct "Shift1" schedule selection is highlighted (arrow 4 in Figure 9)

The appropriate selection, "Bag (CVS)" or "Bag (BMD) is highlighted (arrow 5 in Figure 9)

The "Cert Zero Span" button is selected green (arrow 6 in Figure 9)

Click on the "OK" button (arrow 7 in Figure 9).

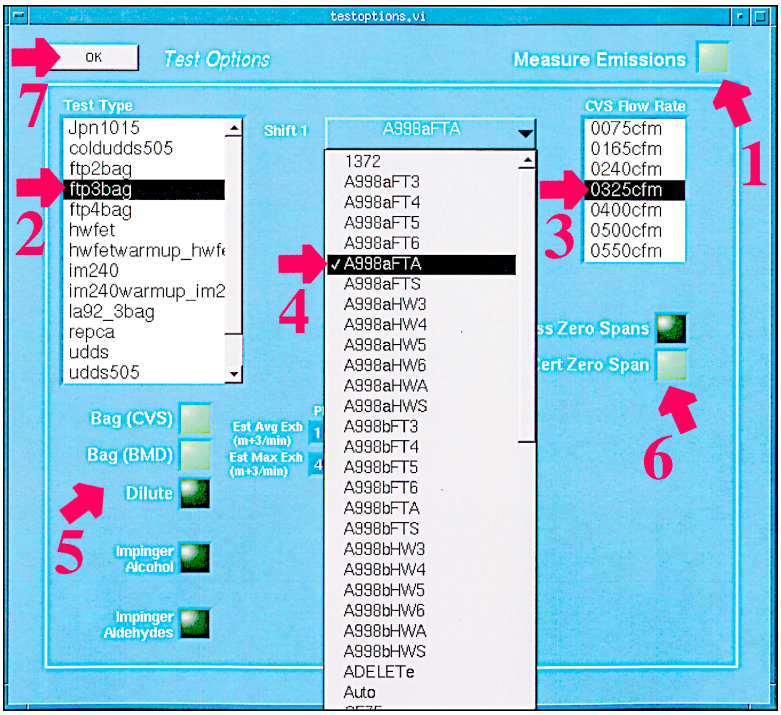


Figure 9

7.9.4 On the "vehicledata.vi" screen, enter the Driver ID Number, Operator ID Number, and Odometer data in the proper fields on the left side of the screen. See Figure 10.

Verify that corresponds to the data on Form 700-01 as follows:

Data on screen	Data on Form 700-03
Test Number	Test Number
Vehicle ID by EPA	Vehicle ID#
Drive Code.	Drive Code
Vehicle Weight	Equivalent Test Weight

If there is an error, notify the senior technician for further instructions.

Click on the "OK" button.

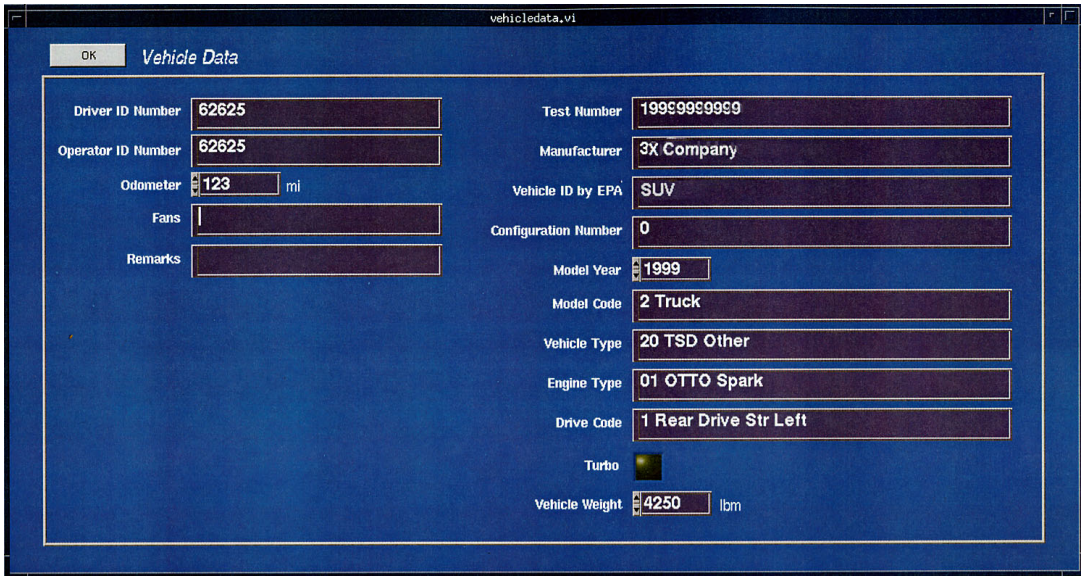


Figure 10

7.9.5 On the "fueltable.vi" screen, verify that the correct "FuelContID" is selected. The "No Match" label in the lower right corner of the screen will be colored red if an incorrect container is selected.

When the proper "FuelContID" in the upper left corner is selected, the label will turn green. See Figure 11.

Click on the "OK" button.

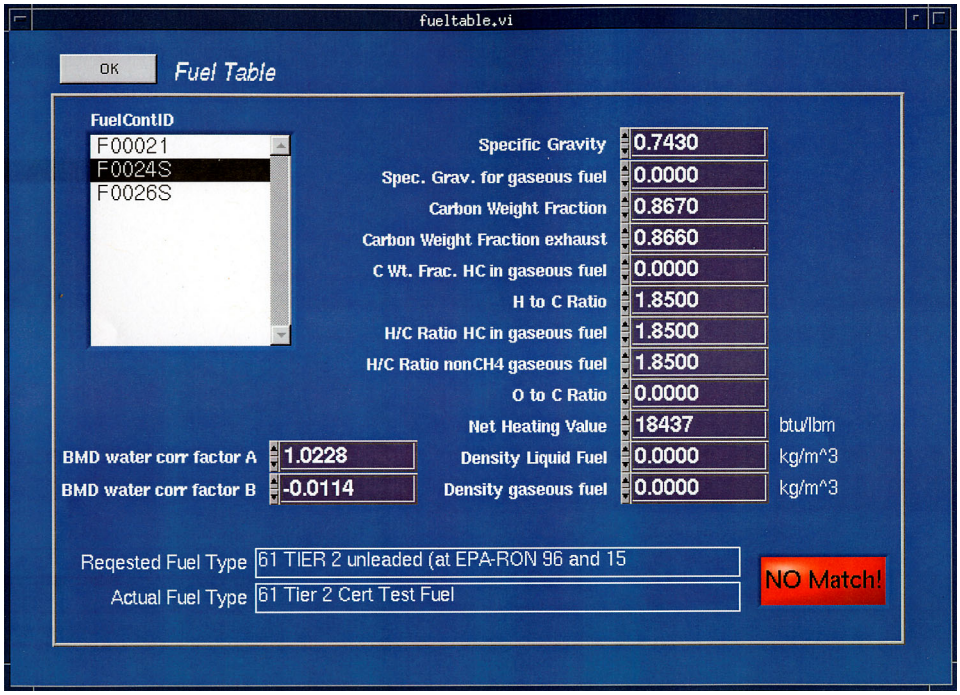


Figure 11

7.9.6 The "runsavereview.vi" screen will appear. See Figure 12. If you need to change an input, click on the "Review Entries" button and make the necessary correction(s). See arrow 1 in Figure 12.

If no changes are needed, click on the "Save Answer File" button. See arrow 2 in Figure 12.

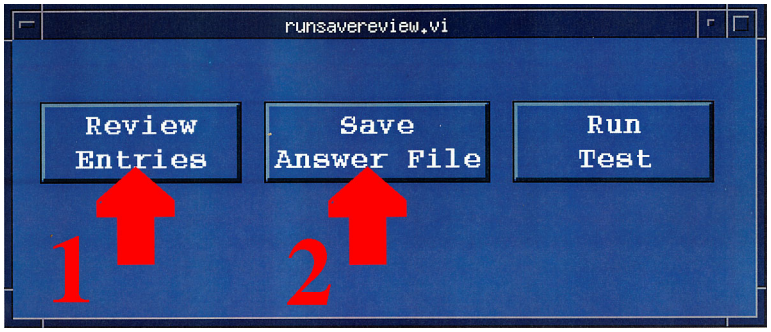


Figure 12

7.9.7 The "Save as [answer file name] dialog box will appear. See Figure 13. Verify that the number appearing after "Answer file name:" is correct for the test being conducted.

Click on the "Enter" button.

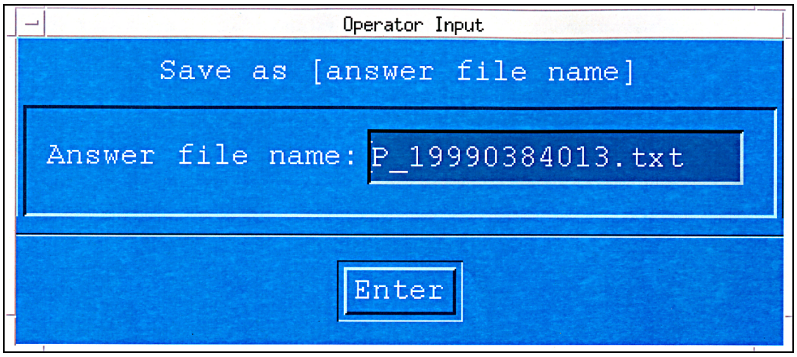


Figure 13

7.9.8 The "runsavereview.vi" screen will appear. See Figure 14. Click on the "Run Test" button. See the arrow in Figure 14.

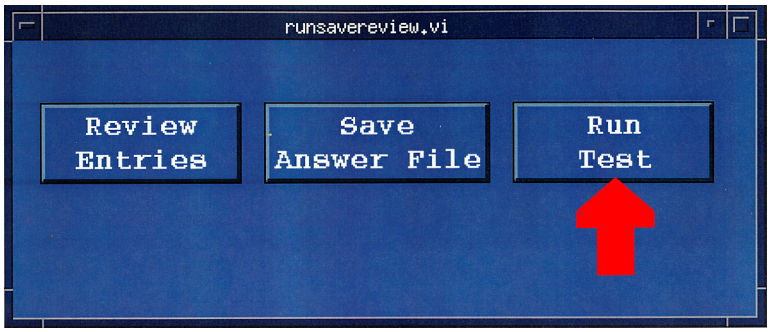


Figure 14

7.9.9 The "Perform BMD Purge (Short)" dialog box will appear. See Figure 15. If the "Sample Emissions with Bag Mini Diluter" box was checked in Step 7.7.6, select the "Yes" button.

If the "Sample Emissions with Bag Mini Diluter" box was not checked in Step 7.7.6, select the "No" button.

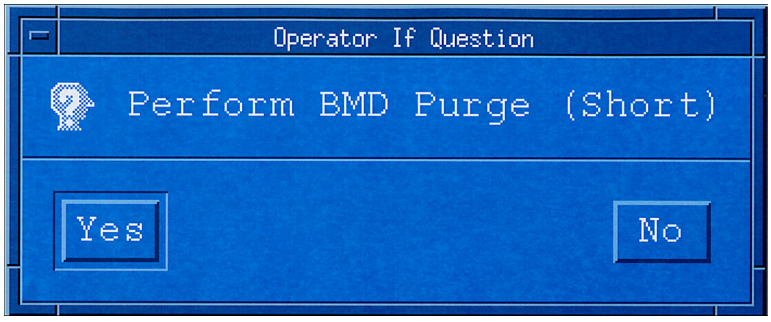


Figure 15

7.9.10 During the entire test schedule set-up, the Operator Message" screen will provide a continuous flow of information informing the operator of the status of the procedure.

See Figure 16.

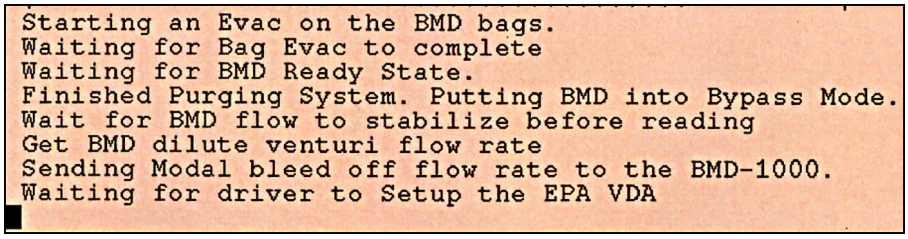


Figure 16

7.9.11 When the purge operation is completed, the "Test can begin when VDA is ready." Dialog box will appear. See Figure 17.

Click on the "Continue Test" Button.

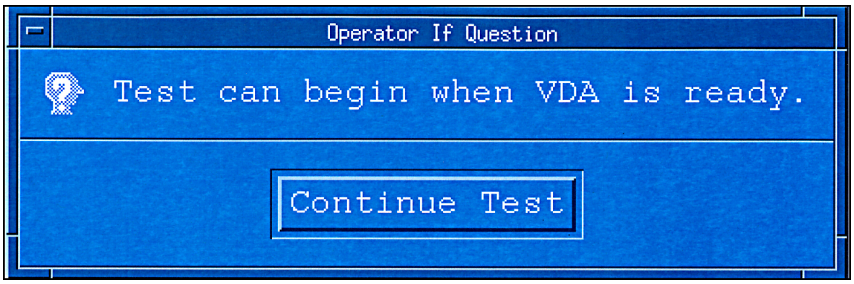


Figure 17

7.9.12 When the "Operator Message" text "Waiting for driver to press START button appears" (arrow 1 in Figure 18), and the "PR monitor" button color is green (arrow 2 in Figure 18), the CDTCS pre-test setup is complete.

If the "PR monitor" button color is red, do not proceed with the test. Notify the senior technician for problem resolution before proceeding.

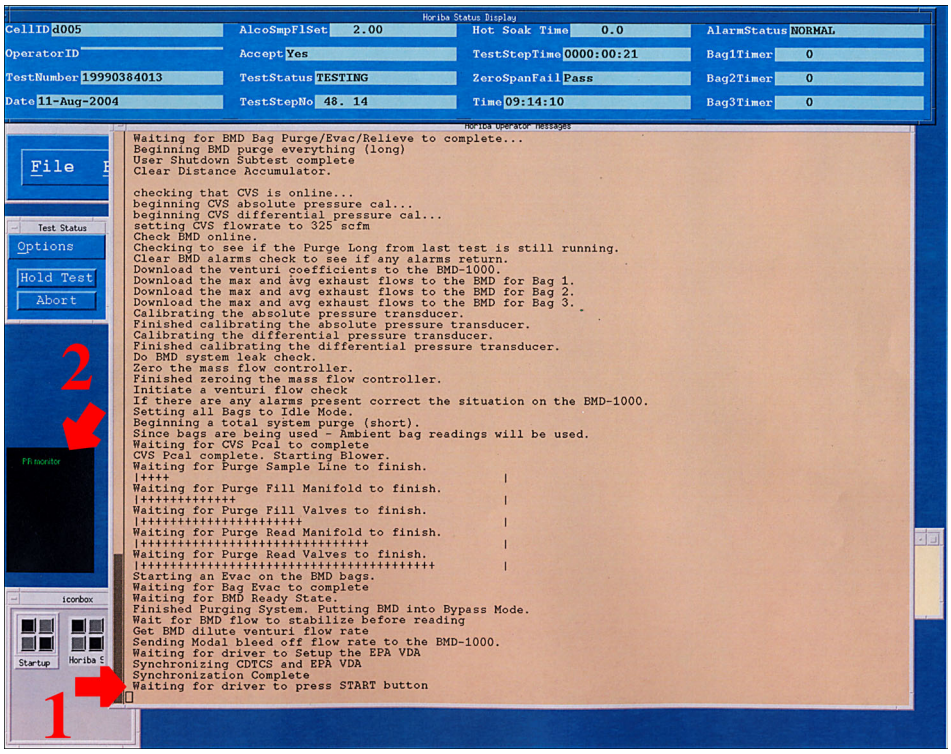


Figure 18

7.10 Verify that the Noresco Controller is in "Test" mode and the temperature and dewpoint are within specifications. If they are not, notify the service technician.

8. Test Procedure

Form 730-01 provides a checklist to verify that each step on the form is completed, thereby ensuring orderly execution of the test procedure. Unless otherwise indicated, the driver is responsible for ensuring that the following steps are performed.

100 48-Inch Single-Roll Electric Dyno Setup

Note: Cradle and centering functions can be controlled by either the CTM250G micro-terminal at the driverís station or the RTM-200 computer keyboard in the site control room.

101 Retract the roll covers of the 48" single-roll electric dynamometer by pressing the "COVER ON/OFF" button on the CTM250G Driverís Station.

Personnel in the test cell should avoid close proximity to the vehicle when the 48" single-roll electric dynamometer roll cradle is raised or lowered.

102 Raise the roll cradle by pressing the "CRADLE UP/DOWN" button on the CTM250G Microterminal.

103 To engage the dyno contact, press <START> on the CDC-900 cabinet or <START> on the remote driverís station pendant.

104 For the FTP, do not start the engine, place the drive wheels of the vehicle on the dynamometer roll, and leave the vehicle in neutral.

For the HFET, drive the vehicle onto the dynamometer, place the drive wheels on the dynamometer roll, and leave the vehicle in neutral.

105 Center the vehicle by pressing the CTM250G Microterminal "CENTERING START/STOP" button.

106 In response to the prompt on the CTM250G Microterminal screen, use the CTM250G driverís station keyboard to enter the value specified for the VSR vehicle weight (equivalent test weight).

The "CENTERING START/STOP" button on the CTM250G Microterminal will remain lit, and the RTM-200 computer screen will show acceleration to a speed of 1 mph while the rolls are turning.

107 Position one of the wheel chock assemblies around a non-drive wheel of the vehicle. Insert the linkage bar locking nuts in the tee-slot tracks.

108 Slide the moveable wheel chock so that both parts of the chock assembly fit against the tire and draw the chocks firmly together against the tire by turning the handle clockwise on the threaded rod.

109 Secure the locking nuts which bolt the free end of the linkage bars to the tee-slot tracks.

110 Repeat Steps 108 through 110 to position the other wheel chock assembly against the other non-drive wheel of the vehicle.

111 Visually ensure that the front and rear cradle rolls are turning at about the same speed and the vehicle drive wheels are positioned approximately at the roll surface crown.

If not, adjust the wheel chock positions until the rolls appear to be turning at the same speed.

112 Stop the rolls by pressing the CTM250G "CENTERING START/STOP" button.

113 Lower the cradle by pressing the CTM250G "CRADLE UP/DOWN" button.

114 Cover the exposed portion of the rolls by pressing the CTM250G "COVER ON/OFF" button.

115 Check and, if necessary, adjust the drive tires to the manufacturerís recommended pressure per data on Form 700-03, unless otherwise specified.

116 Use the RTM-200 computer keyboard for this step through Step 226. Select "ROAD SIMULATION" from the "DYNAMOMETER MAIN MENU" screen.

117 Ensure that the "BRAKE" is "OFF" and the "CRADLE" is "DOWN," and observe that the rolls are not moving.

118 Obtain the "VEHICLE SIMULATION PARAMETERS" screen by pressing <F2>.

119 Select the appropriate vehicle ID by pressing <PgUp> or <PgDn>. The vehicle ID will be shown next to "Class" on the screen.

120 Recall or enter the correct test number, inertia (ETW), and A, B, and C coefficients. The A, B, and C coefficients are in the comments section of Form 700-03.

121 Look at the RTM-200 computer screen and ensure that the "Augmented Braking" is "OFF," unless indicated otherwise on Form 700-03. Use the right or left arrow key to turn "Augmented Braking" either "ON" or "OFF."

122 Use the right or left arrow key to select "NO" for "Grade" simulation.

123 To return to the "SETUP MODE" of the "ROAD SIMULATION" screen, press <Esc>.

124 If no warning messages are displayed, press <F1>, followed by <Esc> to return to the "RUN MODE."

125 If warning messages are displayed, address the warning (see "Horiba Dynamometer Operations Manual"), then press <F1>, followed by <Esc> to return to the "RUN MODE."

200 Test Vehicle Dynamometer Hookup

201 Connect the vehicle restraint system.

202 Use the required connectors and flexible hose to connect the vehicle exhaust system to the Horiba Analysis System CVS.

203 Open the hood or engine compartment cover.

204 Position the cooling fan(s) within 12 inches of the vehicle (unless otherwise specified on Form 700-03) and turn the power to the cooling fan(s) on.

Place a check mark on Form 700-03 indicating that the hood is up and fan is operational.

205 On Form 700-03, use the drawing of the vehicle and indicate the fan placement.

206 Place the wheel chocks in front of the non-drive wheels.

If airplane style chocks are used, position each around a non-drive wheel of the vehicle and tighten them until they fit snugly around the tire.

207 Check that all accessory switches on the test vehicle are in the "Off" position prior to starting the engine.

208 Check and, if necessary, adjust the drive tire pressure to 45 psi, unless otherwise specified on Form 700-03. If other than 45 psi, record tire psi set.

209 Ensure that the correct starting procedures are located in the vehicle. If they are not, contact the senior technician.

300 VDA System and CDTCS Exhaust Sample Analysis

301 If at any time there is a CVS problem detected by the CDTCS, a warning light will be activated on the VDA stand. The driver must immediately stop the vehicle and turn the engine off.

302 Before driving the test vehicle on the 48" single-roll electric dynamometer, ensure that it is in the "RUN MODE" and the contact has been engaged.

Under the "Test" menu, position the mouse pointer on "Test" and press and hold down the mouse button, opening the "Test menu." Continue to hold down the mouse button, pull the mouse toward you, and position the pointer on "Setup for Driving;" then release the mouse button to select it. See Figure 8.

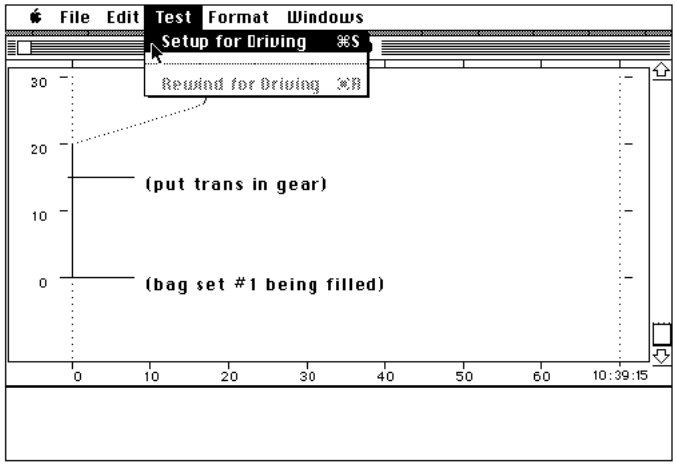


Figure 8

303 Verify that the CVS blower and cooling fan(s) are "On" prior to starting the test. Verify that the indicators on the VDA screen for "Blower" and "Pump" are "On."

See Figure 9.

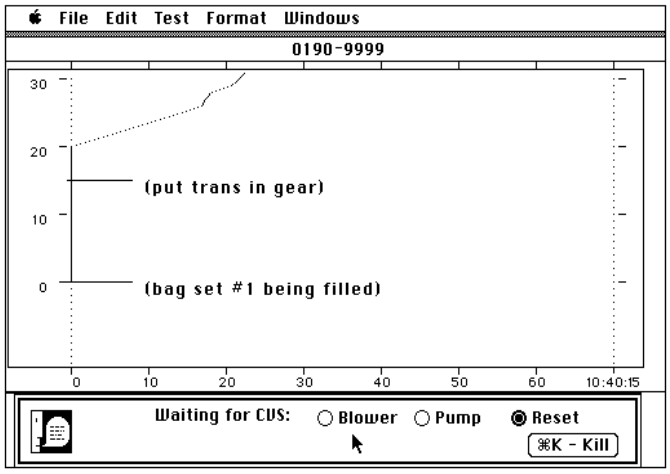


Figure 9

304 Before starting the engine, ensure that the "Ready" indicator on the bottom of the VDA screen is on. See Figure 10.

If the test vehicle is in the Recall program, start the engine according to the technical directive instructions for this vehicle.

Otherwise, if the test type is HFET, go to Step 339

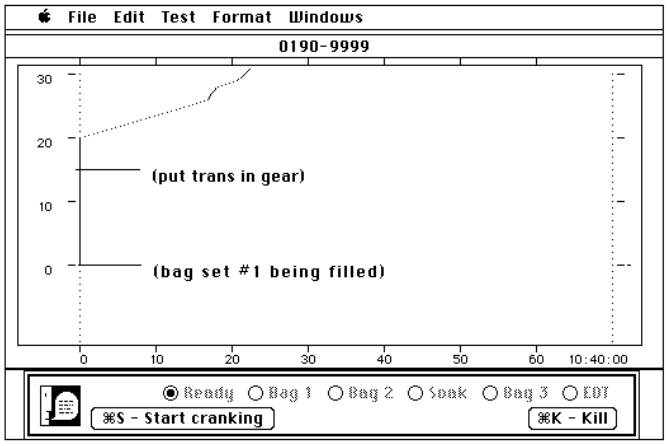


Figure 10

305 Simultaneously start the test vehicle's engine, according to the manufacturer's recommended starting procedures, and press <Command S>.

If the engine starts and continues to run, go to Step 307.

If the vehicle does not start after 10 seconds of cranking, the cranking shall cease and the reason for failure to start shall be determined. Select the "Hold cranking > 10 sec." button at the bottom of the screen by pressing <Command-Space Bar>. See Figure 11

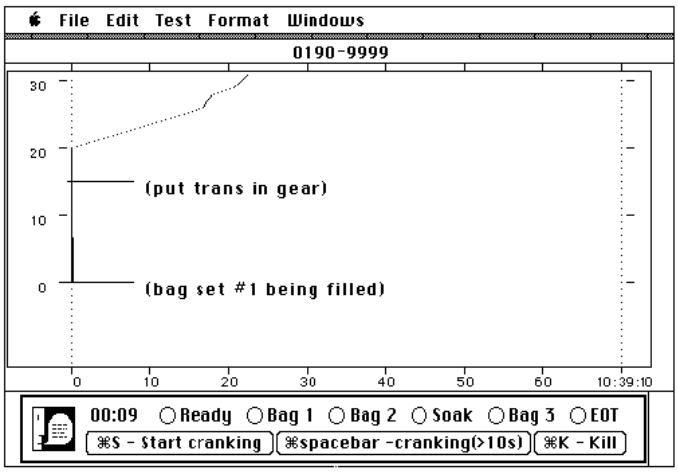


Figure 11

The "Hold sampling" button will now appear on the bottom of the screen. See Figure 12. The CVS sample selector valves shall be turned off by pressing <Command-Space Bar>.

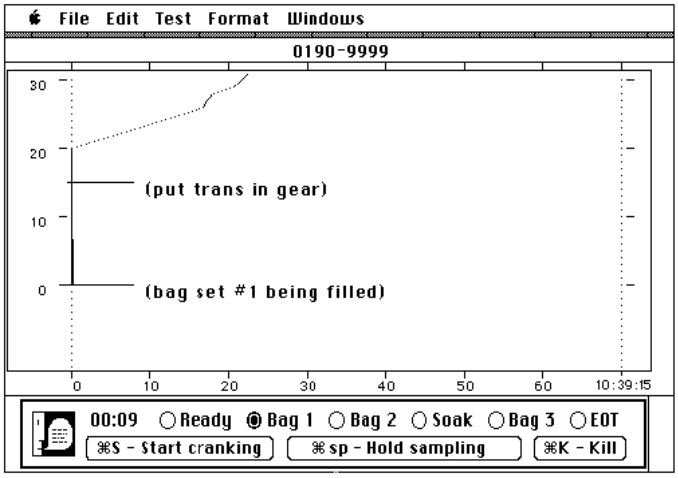


Figure 12

The CVS compressor (blower) and cooling fan(s) shall be turned off during this diagnostic period. V-Mix counts are not zeroed or reset prior to attempting to restart the vehicle. After an unsuccessful start attempt, notify the senior technician, the manufacturer's representative (certification vehicles), or the appropriate EPA Task Officer (in-use vehicles) for further instructions.

If the failure to start is determined to be a vehicle malfunction, corrective action of less than 30 minutes duration may be taken by the manufacturer's representative if accompanied by Certification personnel or the appropriate Task Officer.

If the failure to start is determined to be an operational error, the test will be void and the vehicle will be rescheduled for testing. Complete Form 902-01, obtain all approved signatures, and file with the data processor.

306 Second start attempt: If the test vehicle is in the Recall program, restart the engine according to the technical directive instructions for this vehicle. When you are ready to attempt to start the vehicle again, make sure that the CVS blower and sample pumps are on. Verify that the VDA "Ready" indicator is on.

If necessary, reset the VDA Control dialog box by pressing <Command-S> to select the "Try again" button. See Figure 13.

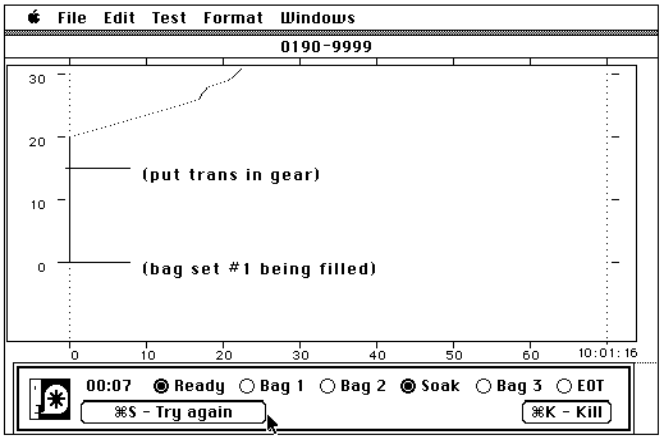


Figure 13

Simultaneously start the test vehicle's engine, according to the manufacturer's recommended starting procedures, and press <Command S>. If the engine starts and continues to run, go to Step 307.

If a second start is attempted and the vehicle does not start within 10 seconds of cranking, pause for 10 seconds and crank again. A total of not more than three 10-second cranks, with 10-second pauses between each crank, should be attempted. After three unsuccessful start attempts, notify the senior technician, the manufacturer's representative (Certification Vehicles), or the appropriate EPA Task Officer (In-Use Vehicles) for further instructions.

307 Press <Command S> to start the VDA trace scrolling. The crank time will be displayed on the left side of the dialog box. See Figure 14.

If the key has not been turned to the start position and you need to stop, simultaneously press the <Command> key and the space bar to stop scrolling. Select "Re-set up Test" in the control dialog box. To reset the trace with the mouse pointer, point the arrow on the "Re-set up Test" box and click the mouse one time. Return to Step 302.

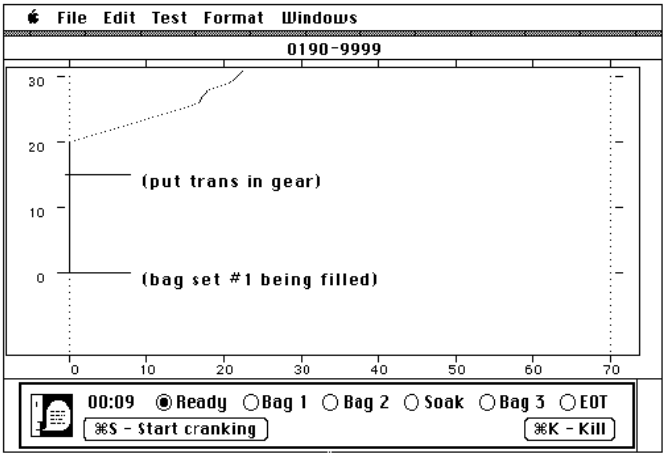


Figure 14

308 Verify that the "Bag 1" indicator is on.

309 If the engine false starts (i.e., does not continue to run when the ignition switch is returned to the "ON" position following the cranking), repeat the recommended starting procedure, pausing for 10 seconds before cranking for 10 seconds, unless otherwise recommended by the manufacturer or appropriate Task Officer. Complete Form 902-01, obtain all approved signatures, and file with the data processor.

If the vehicle's engine false starts three times, cease cranking, notify the senior technician, the manufacturer's representative (Certification Vehicles), or the appropriate EPA Task Officer (In-Use Vehicles) for further instructions.

If the vehicle cannot be restarted before the initial acceleration, stop the VDA trace from scrolling by pressing <Command-Space Bar>. See Figure 15.

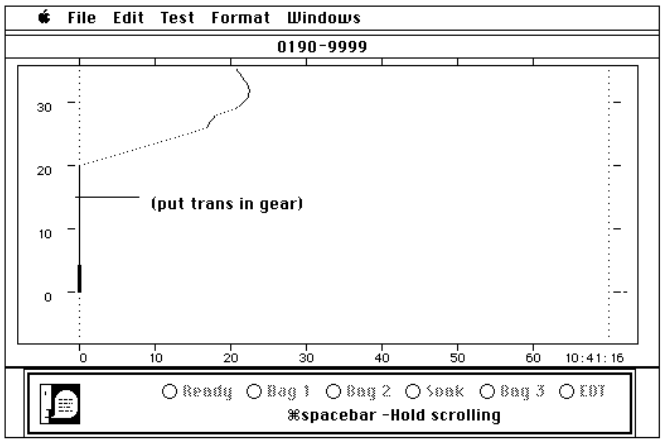


Figure 15

310 If the engine starts and continues to run, start the VDA trace scrolling by pressing <Command-S>, following the instructions at the bottom of the screen. See Figure 16.

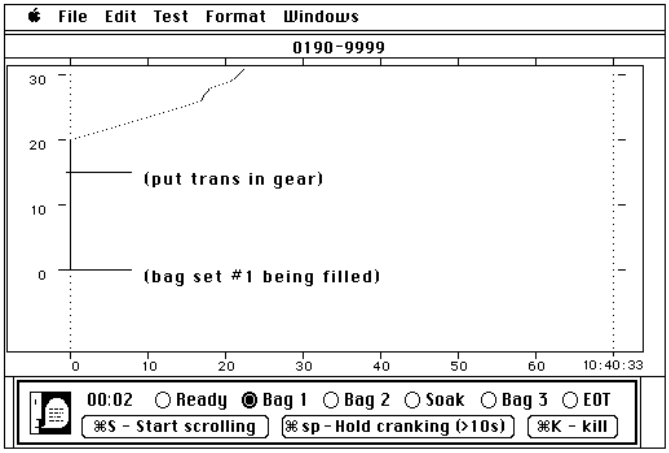


Figure 16

311 If you need to stop, select the Kill button by pressing <Command-K>. To resume the procedure, position the mouse pointer on "Test." Press and hold down the mouse button and pull down the "Test Menu." Position the pointer on the "Rewind" menu item and release the mouse button to select it.

If you did rewind, go to Step 302, otherwise continue.

312 Operate the test vehicle as described in CFR 86.137 for the Urban Dynamometer Driving Schedule (UDDS). See Attachment I, "UDDS Specifications" for a list of driving techniques.

If a condition occurs at any time during the driving of the UDDS that requires the driver to add a comment, press <~>. This will flag the data for entry of a comment at a time convenient for the driver.

313 If the vehicle is driven at Wide Open Throttle (WOT), indicate all places where this occurs on the driver's trace. See Section 500, Editing Driving Events (Entering Comments), for instructions.

314 At the 505-second point of the UDDS, the VDA will automatically switch to the second set of sample bags. See Figure 17.

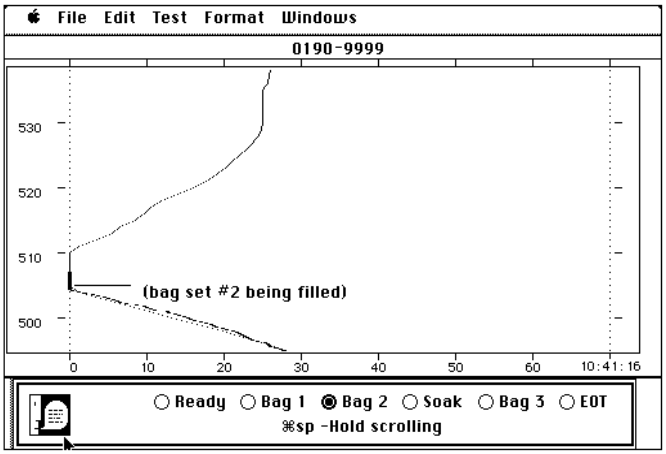


Figure 17

315 Two seconds after the end of the last deceleration of the UDDS (the 1369-second point on the driving schedule), turn the engine off.

316 When the engine stops running, press <Command-S>. Five seconds later, the sampling will automatically stop and the soak indicator on the VDA screen will light. See Figure 18. The VDA will automatically reset to the beginning of the next driving schedule.

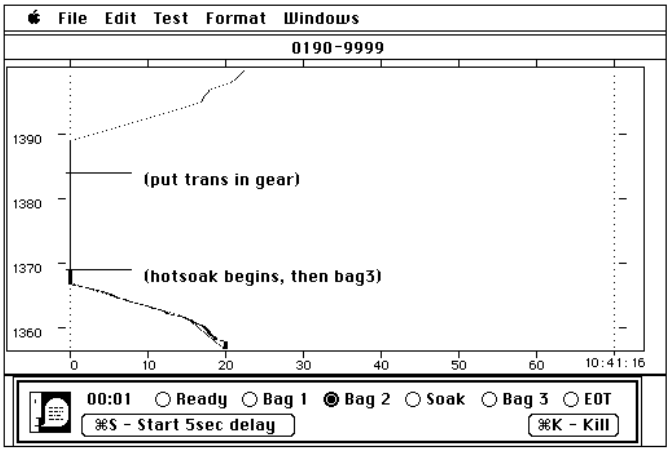


Figure 18

317 Close the vehicle hood and verify that the power to the fan and CVS blower are turned off. The VDA also monitors the hot soak time on its screen. See Figure 19. The total soak time must be 10 minutes, ±1 minute.

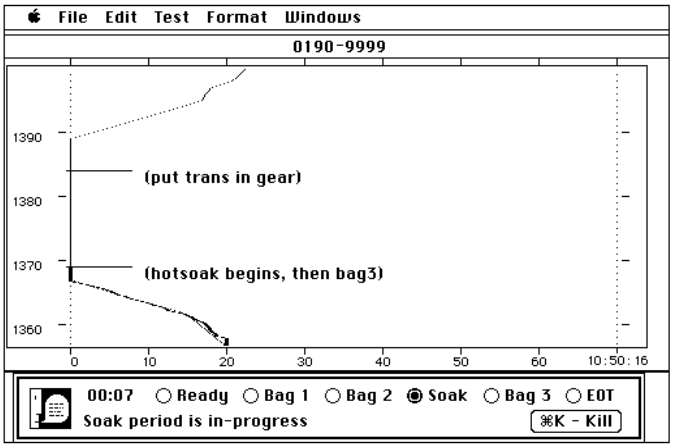


Figure 19

318 For Fuel Economy Vehicles only, monitor the cell temperature during the 10-minute soak, particularly for the first 4 minutes, to ensure that it does not exceed the tolerance of 68-86 ^{o}F. It is desirable to maintain the set point temperature of 75 ^{o}F.

If the temperature drops below 72 ^{o}F, the reheat thermostat on the test cell air handling unit should be adjusted. If corrective action fails, notify the senior technician.

319 When the Horiba Analysis System, VDA, or CVS indicates that 9 minutes have elapsed open the vehicle's engine compartment cover. Verify that the cooling fan(s) are on.

320 If the required 10-minute soak (±1 minute) has been completed and the "Ready" indicator on the VDA screen is on, start the test vehicle's engine according to the manufacturer's recommended hot-start procedures and follow the instructions in the control dialog box at the bottom of the screen.

321 To start sampling, press <Command-S> and ensure that the "Bag 3" indicator is on; then crank the engine. See Figure 20.

If the vehicle does not start within 10 seconds, see Steps 307 through 314 for details. The crank time will be displayed on the left side of the control dialog box.

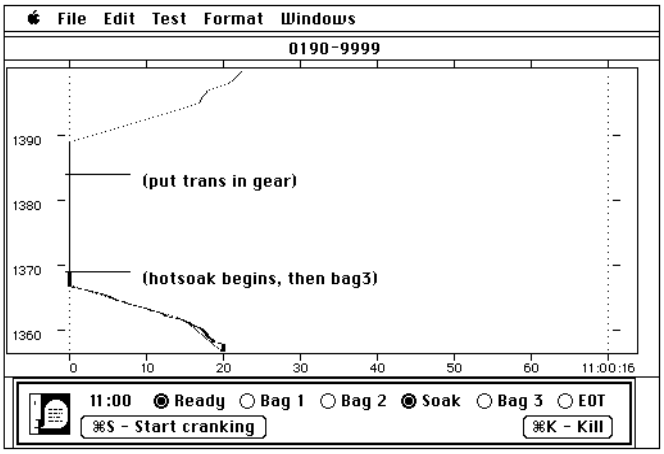


Figure 20

322 If the vehicle engine starts and continues to run, start the VDA trace scrolling by pressing <Command-S>, following the instructions at the bottom of the screen. See Figure 21.

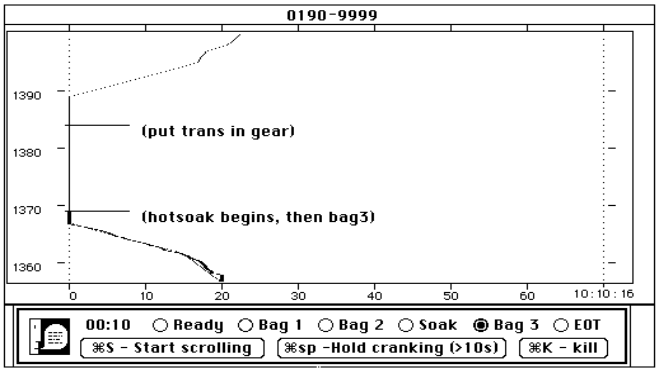


Figure 21

323 Drive the remainder of the test (hot-start transient phase, Bag 3) according to the UDDS.

324 At the 1874-second point of the UDDS, the VDA will automatically switch off the 3rd set of sample bags. See Figure 22. The "EOT" indicator will come on and the VDA will automatically save the test data.

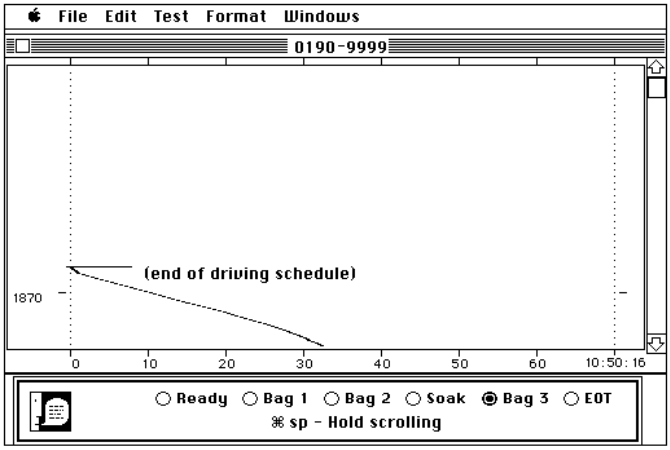


Figure 22

325 If the vehicle requires a Sealed Housing for Evaporative Determination (SHED) hot-soak test, leave the engine running, apply the brakes, and remain seated while the vehicle is being disconnected from the dynamometer and sampling system.

If not, go to Section 400 for vehicle removal from the electric dyno.

If a HFET is required, go to Attachment J for details. See Attachment K for an example of the HFET Video Drivers Aid Report.

326 At the end of each bag set, the CDTCS will take a sample reading of the exhaust sample bag concentration. It will determine what analyzer ranges to use for the analysis. The following steps will be performed automatically after each bag set.

The CDTCS will set the zeros for each analyzer. See Figure 23.

The CDTCS will set the spans for each analyzer. See Figure 24 on the next page.

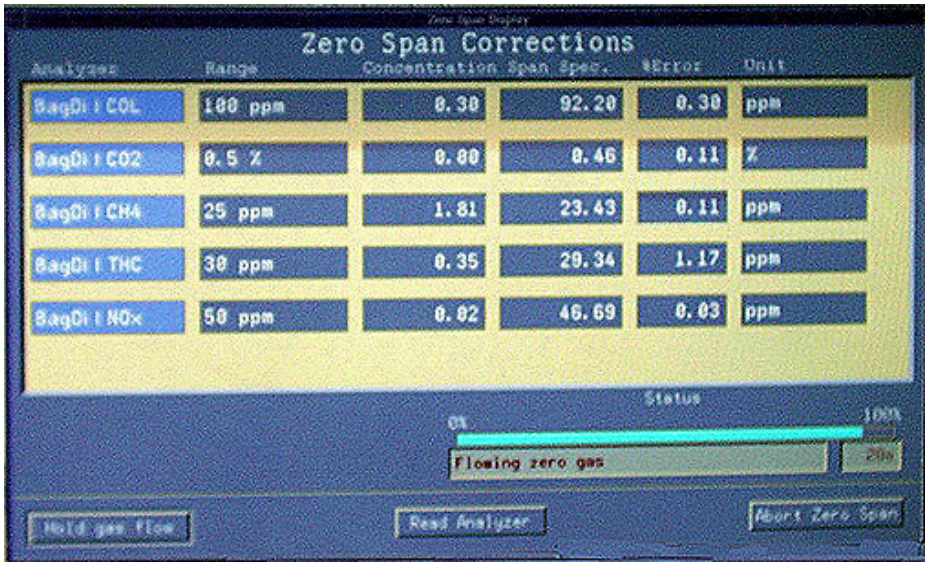


Figure 23

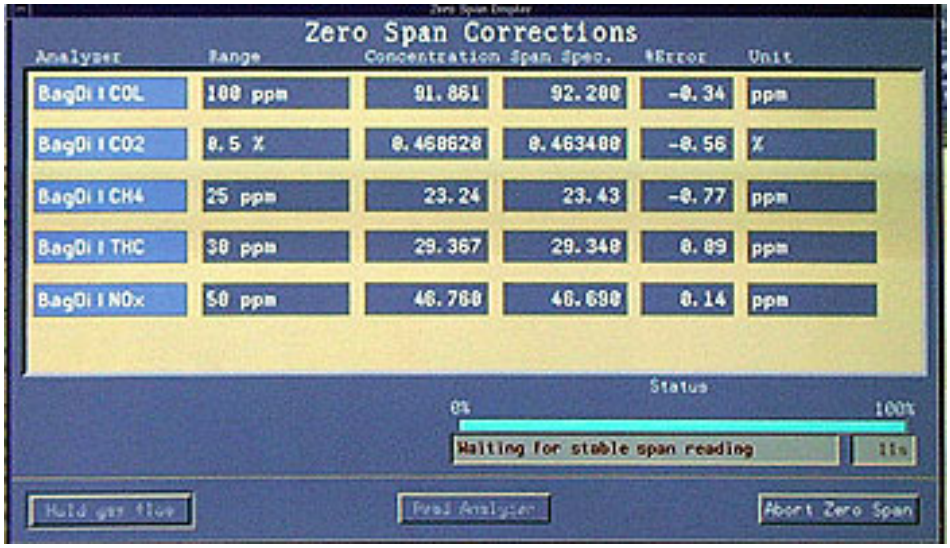


Figure 24

327 The CDTCS will take the exhaust sample bag readings for each analyzer. See Figure 25

Figure 25

328 The CDTCS will take the background bag readings for each analyzer. See Figure 26.

Figure 26

329 The CDTCS will check that the zeros for each analyzer are within tolerance. If not within 2% of the initial setting the CDTCS will repeat the analysis process. See Figure 27.

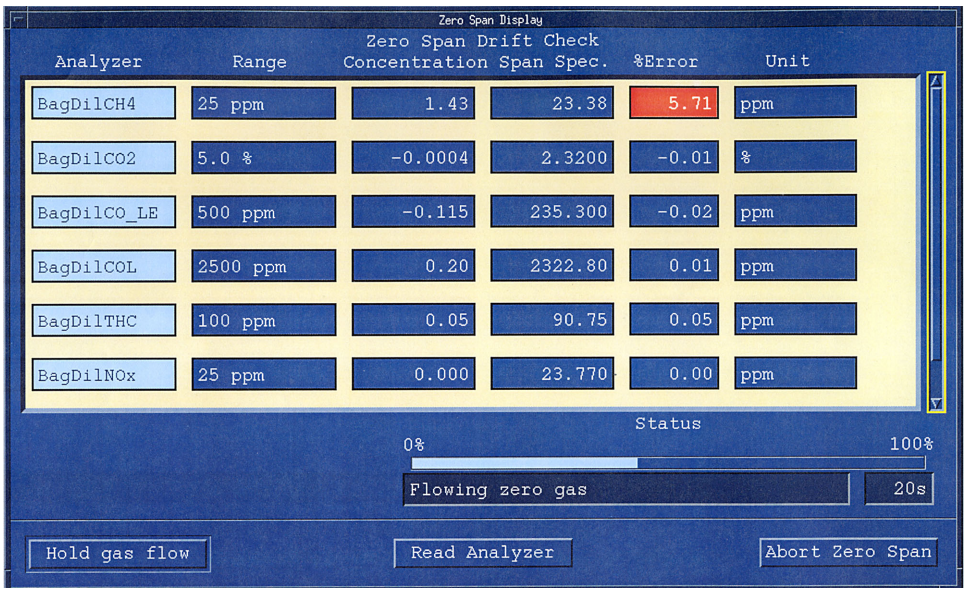


Figure 27

330 The CDTCS will automatically check that the spans for each analyzer are within tolerance. If not within 2% of the initial setting the CDTCS will repeat the analysis process. See Figure 28.

Figure 28

331 On the CDTCS computer, the Operator If Question, "Do you want to run reports now?" screen will automatically appear. See Figure 29. Click on the "YES Run Now" button.

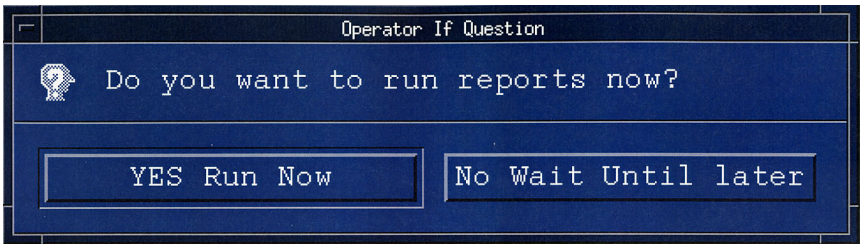


Figure 29
Operator If Question

332 In the "Report Option Dialog" under "Please select reports you want," click in the box next to "Zero Span." See Figure 30. A check mark will appear in the box.

Click on "OK."

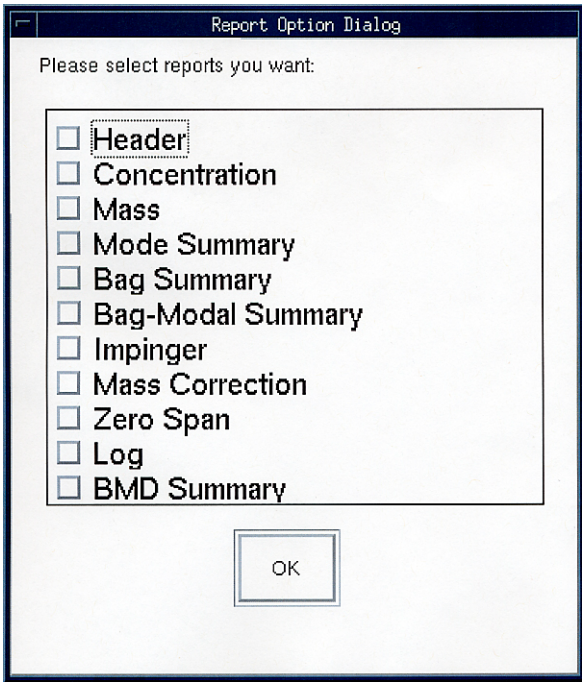


Figure 30

333 In the "Printer Control" dialog box under "Print Report?" click the "Print" button to print the report. See Figure 31.

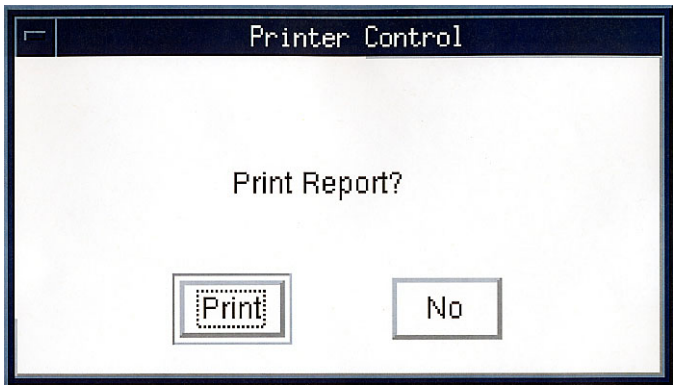


Figure 31

400 Vehicle Removal - 48" single-roll electric dyno

401 Print the "DYNAMOMETER REPORT" by pressing <Alt> and <P> on the RTM-200 computer keyboard. Verify that the A, B, and C coefficients on the "DYNAMOMETER REPORT" correspond with the data on the VSR. If there are omissions, inconsistencies, or errors, notify a senior technician.

If there are no omissions, inconsistencies, or errors, enter your technician ID number and the date on the "DYNAMOMETER REPORT" and place it in the test packet.

402 Press <F1> on the RTM-200 computer keyboard. The message "END THIS TEST NOW? Y/N" will appear on the screen. Selecting "Y" will save the data and return the controller to the "SETUP MODE."

403 On the RTM-200 monitor, verify that the positive and negative simulation errors are less than ±0.05%, respectively.

If the average positive simulation error equals or exceeds 0.05% or the average negative simulation error equals or exceeds -0.05%, notify the senior technician. The test is void and the vehicle must be rescheduled unless the project manager deems it acceptable for the purpose of this test. Complete Form 902-01.

404 Press the contact "Stop" button on the CDC-900 cabinet.

405 Retract the roll covers by pressing the "COVER ON/OFF" button on the CTM250G Microterminal.

406 Raise the cradle by pressing the "CRADLE UP/DOWN" button on the CTM250G Microterminal.

407 Disconnect the restraint system from the vehicle by loosening the linkage bar locking nuts. Disengage and remove the wheel chock assemblies from the non-drive tires. Slide the assemblies away from the tires and, if necessary, lift the assembly out of the tee-slot tracks to provide more clearance. When the cradle is lowered, the vehicle could move slightly along the roll. Since the movement can be up to one foot in either direction, personnel in the test cell should avoid close proximity to the vehicle when the cradle is lowered.

408 Lower the cradle by pressing the "CRADLE UP/DOWN" button on the CTM250G Microterminal.

409 Apply the roll brake by pressing the "BRAKE ON/OFF" button on the CTM250G Microterminal.

410 Close the vehicle engine compartment cover so that it is fully latched and move the cooling fan(s) out of the way. If there is insufficient time available, another technician should assist.

411 When the vehicle has been removed from the dyno, close the roll covers by pressing the "COVER ON/OFF" button on the CTM250G Microterminal.

412 Drive the vehicle off the dyno at the minimum necessary throttle. If a SHED hot soak is required drive the vehicle to the entrance of the evaporative SHED as soon as it is disconnected (see NVFEL 709).

500 Editing Driving Events / Reviewing Preliminary Report

501 To edit the "VDA Summary Report," position the mouse pointer on the scroll arrow and hold down the mouse button until the "Out-of-Tolerance Events" are in view. See NVFEL 703, for more details. Out-of-tolerance events must be documented**.**

Print the Video Driver Aid Report. See Attachment L for an example of the report.

502 When editing is completed, the VDA will return to "Daily Tests Window."

503 On the Preliminary Laboratory Report, see Attachment M, verify that:

the correct test number and vehicle ID are on the report

the key start time is within 12 to 36 hours of the prep key off time

the fuel type corresponds to the fuel type recorded on the "Test" fuel ticket

the correct inertia weight and horsepower have been entered

the samples were read within the 20-minutes

the cranks times are less than 10 seconds

for Fuel Economy Data Vehicles only, the dew-point is between 42-52 ^{o}F

504 The site operator enters their EPA ID number and date in the appropriate space on Form 700-03.

600 Post-Test Processing

601 On the site Windows NT computer desktop window, click on the "Post Test Processing" icon. See the arrow in Figure 32.

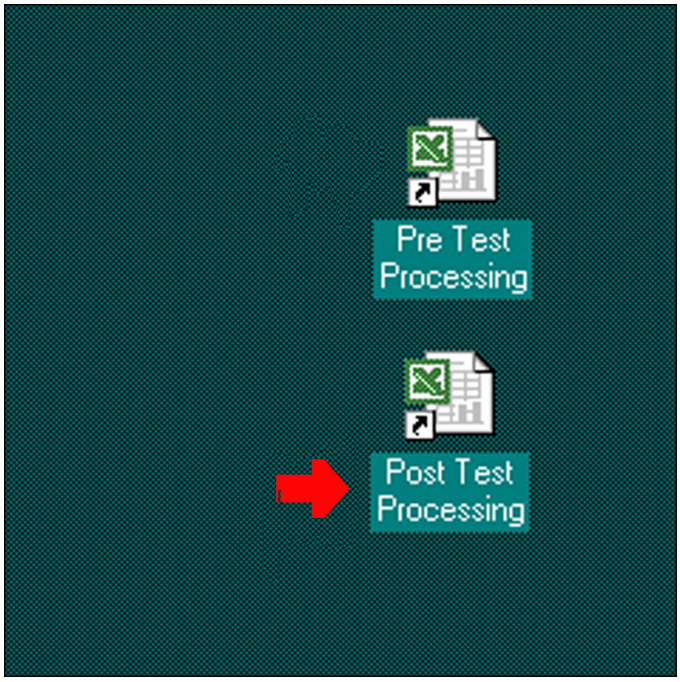


Figure 32

602 In the "Microsoft Excell" dialog box which appears, click on the "Enable Macros" button. See the arrow in Figure 33.

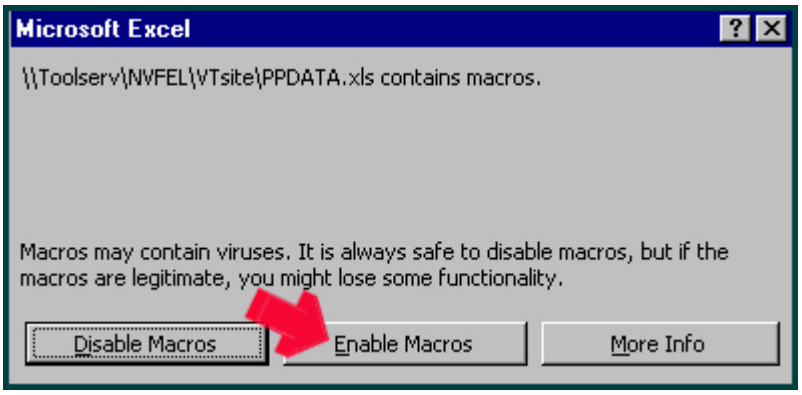


Figure 33

603 In the "PPDATA.xls" dialog box, click on the "Automatic Post Processing" button. See Figure 34.

The "Vehicle Test Data Entry" (VTDE) screen will appear.

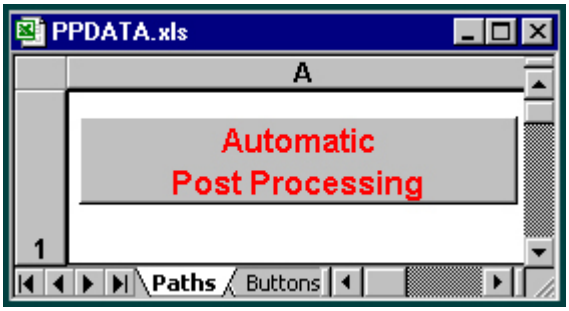


Figure 34

604 On the VTDE screen (Figure 35), verify that each applicable data entry is correct. Use the Vehicle Information (VI) form as the data check. Correct entries by changing data in the field with the keyboard or with the pull-down menu, whichever is appropriate.

If a change is made in a field, the heading will change to italicized in bold-face type (***Tire Pressure, Inertia Weight, Meter 1, etc***).

The "APPLY" button will activate. See arrow 2 in Figure 35.

605 When the VTDE screen is verified, ensure that the proper distance button (MI or KM) next to the "Odometer" field is selected. See arrow 1 in figure 35. This will activate the "APPLY" button if not already activated.

Click on the "APPLY" button. See Arrow 2 in Figure 35.

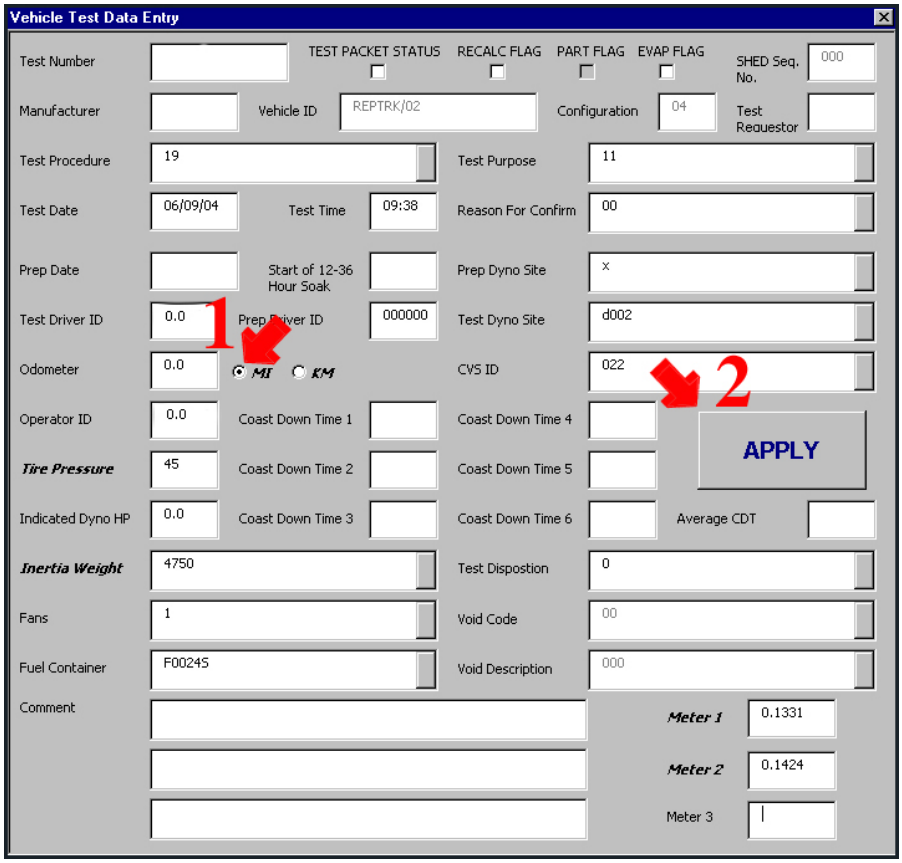


Figure 35

606 Click on the "OK" button in the "RESULTS WILL BE CALCULATED" dialog box.. See Figure 36. The "ENTER YOUR DATA PASSWORD" Dialog box will appear.

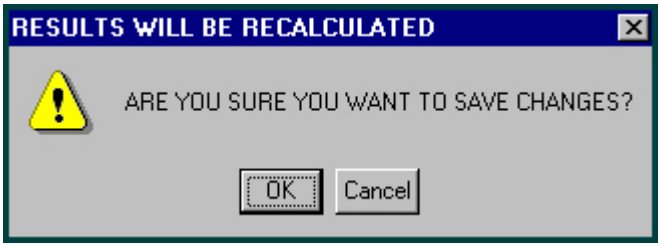


Figure 36

606 In the "Enter Your Data Change Password" field, enter your password. See Figure 37. Press the <Enter> key on the keyboard.

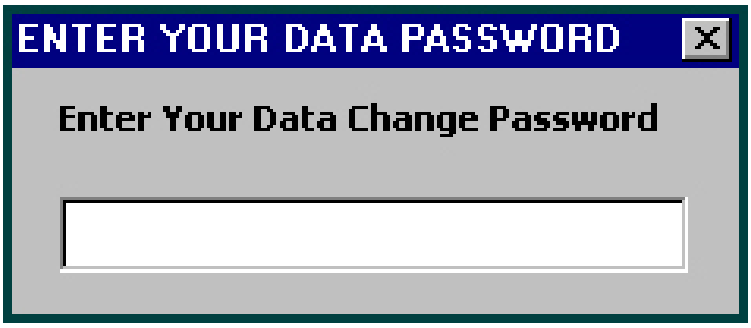


Figure 37

607 In the "Microsoft Excel" dialog box which appears, click on the "Enable Macros" button. See the arrow in Figure 38.

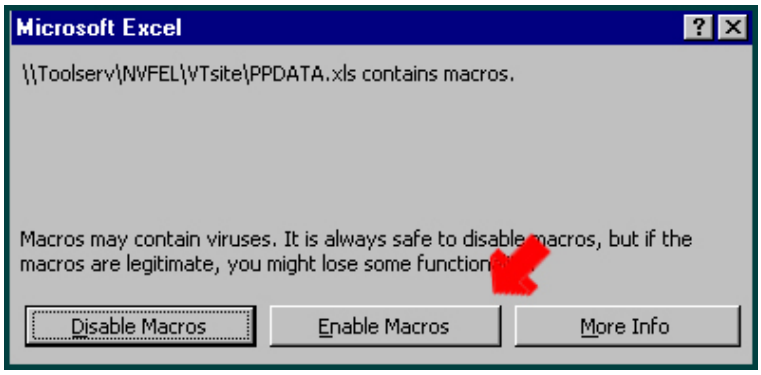


Figure 38

608 In the "NVFEL Laboratory Programs" screen, click on the "VEHICLE TEST SITE Vehicle Test Site Programs" button. See the arrow in Figure 39.

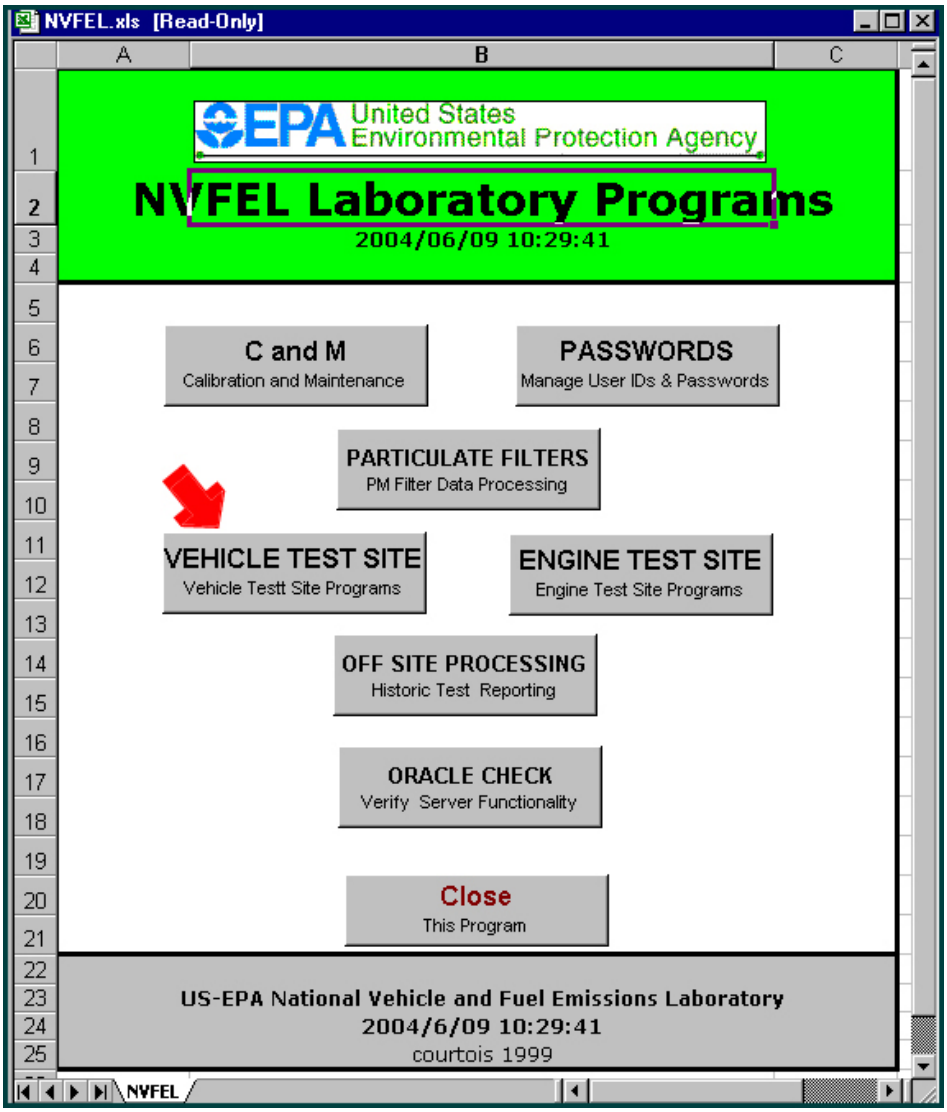


Figure 39

609 In the "Vehicle Test Site Programs" screen, click on the "REPORTS Updates, Reports & Delivery" button. See the arrow in Figure 40.

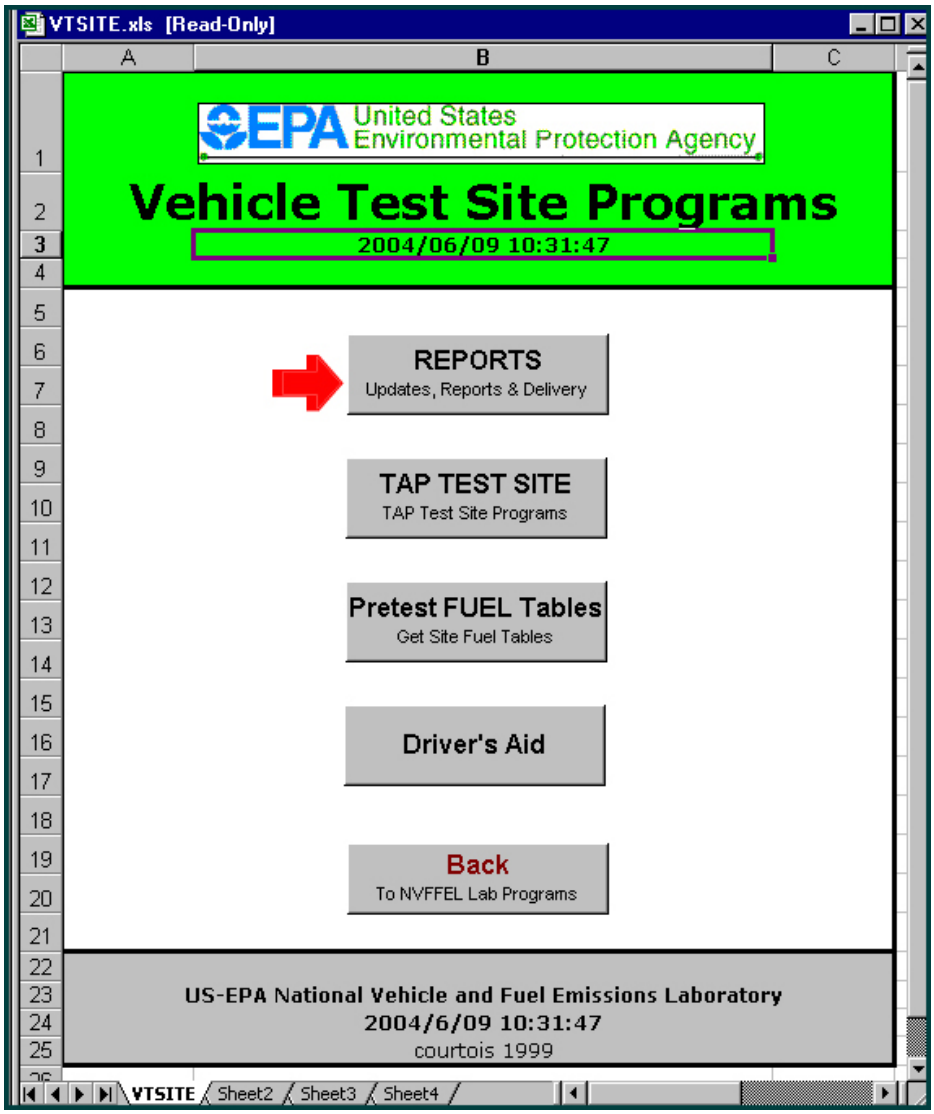


Figure 40

610 In the "Test Data Entry & Update Programs" screen which appears, click on the "SET TPS Set Test Packet Status" button. See the arrow in Figure 41.

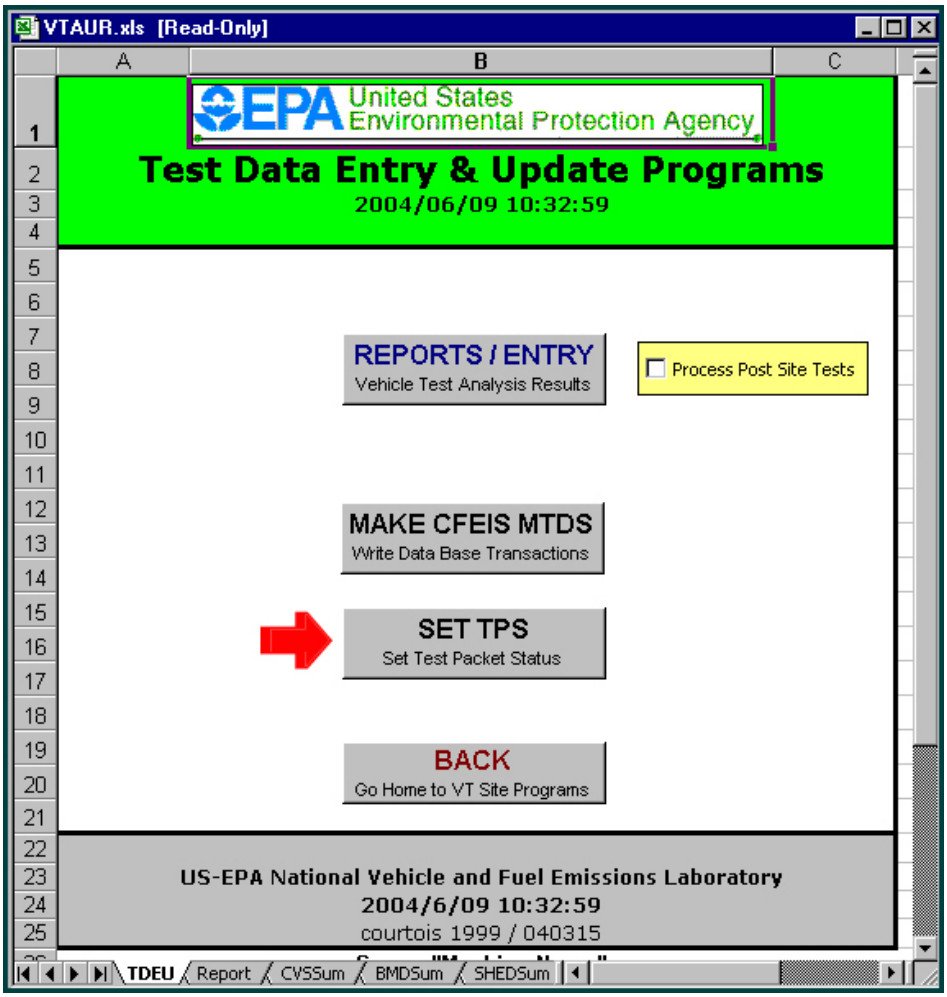


Figure 41

611 Under "Select Test" on the "Set Test Packet Status to Indicate Stabilized Data" screen which appears, click on the down arrow (arrow 1 in Figure 42).

Scroll to the test number being processed then click on the "SET TPS Set Test Packet Status to Stable" button. See arrow 2 in Figure 42.

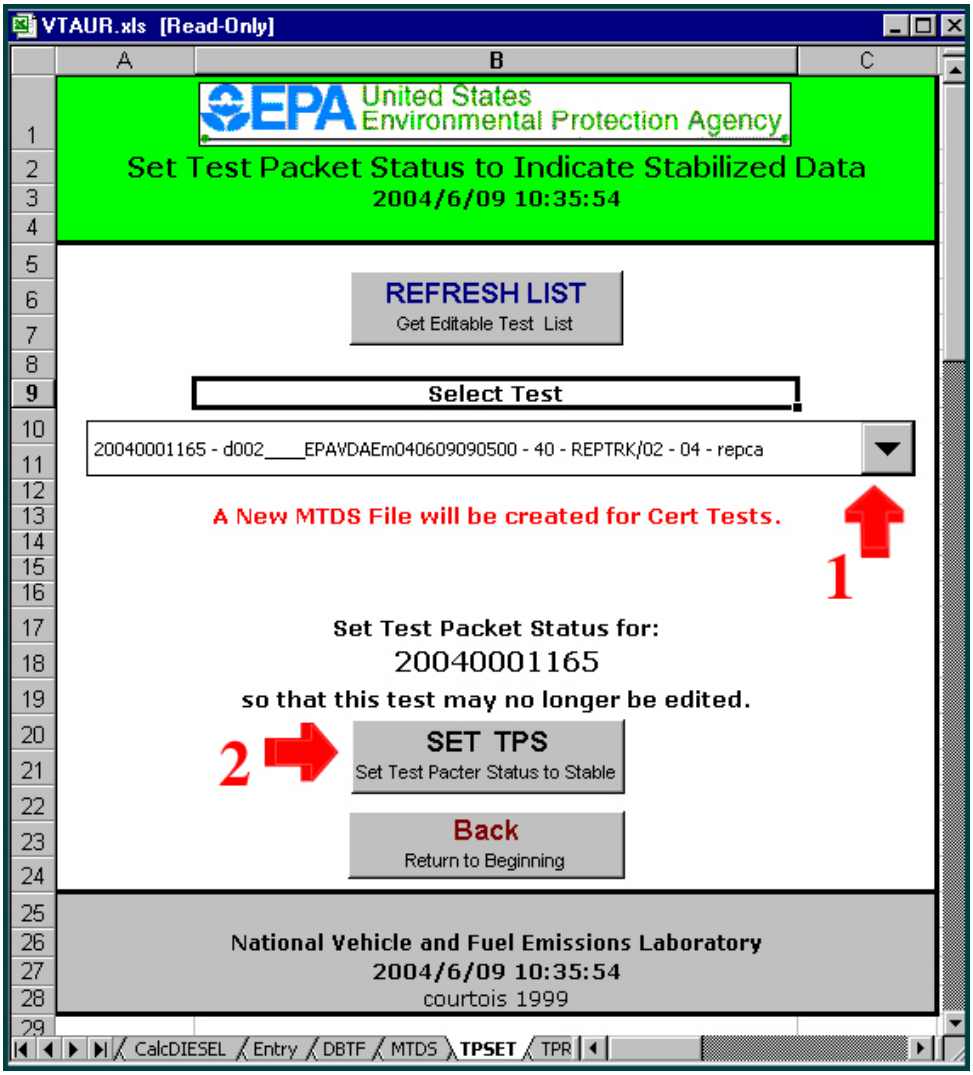


Figure 42

612 Verify that each applicable data entry on the "Vehicle Test Data Entry" screen is correct. Correct entries by changing data in the field with the keyboard or with the pull-down menu, whichever is appropriate.

If a change is made in a field, the heading will change to italicized in bold-face type (***Tire Pressure, Inertia Weight, Meter 1, etc***). The "APPLY" button will activate. See arrow 2 in Figure 35.

When the VTDE screen is verified, click on the box under the "***Test Packet***" title to insert a check mark. See arrow 1 in Figure 43. This will activate the "APPLY" button. See arrow 2 in figure 43.

Click on the "APPLY" button. See arrow 2 in Figure 43.

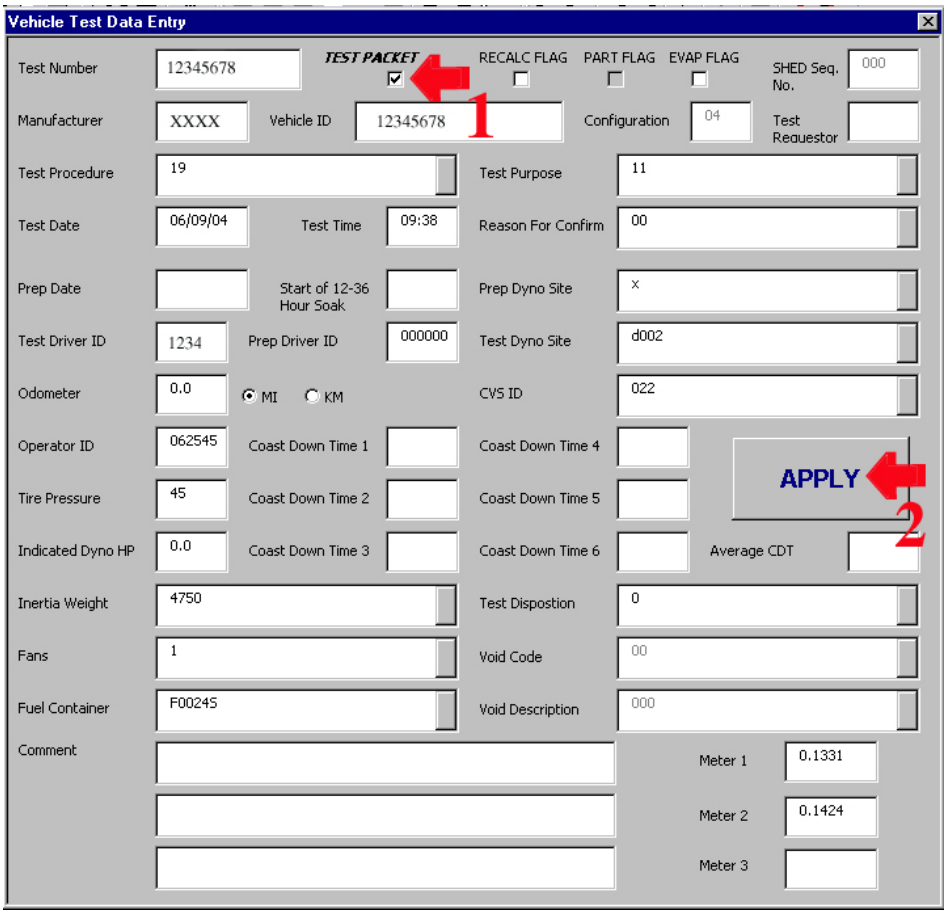


Figure 43

613 When the "ARE YOU SURE YOU WANT TO SAVE CHANGES?" dialog box appears, click on the "OK" button. See Figure 44.

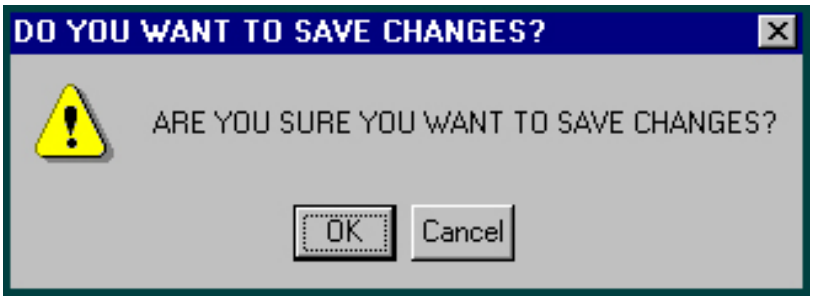


Figure 44

614 In the "Enter Your Data Change Password" field, enter your password. See Figure 45. Press the <Enter> key on the keyboard.

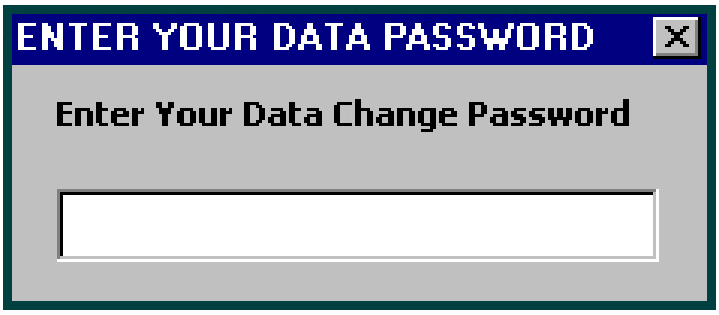


Figure 45
Enter Your Data Change Password

615 The "Set Test Packet Status to Indicate Stabilized Data" screen will appear. Click on the "Back" button. See the arrow in Figure 46.

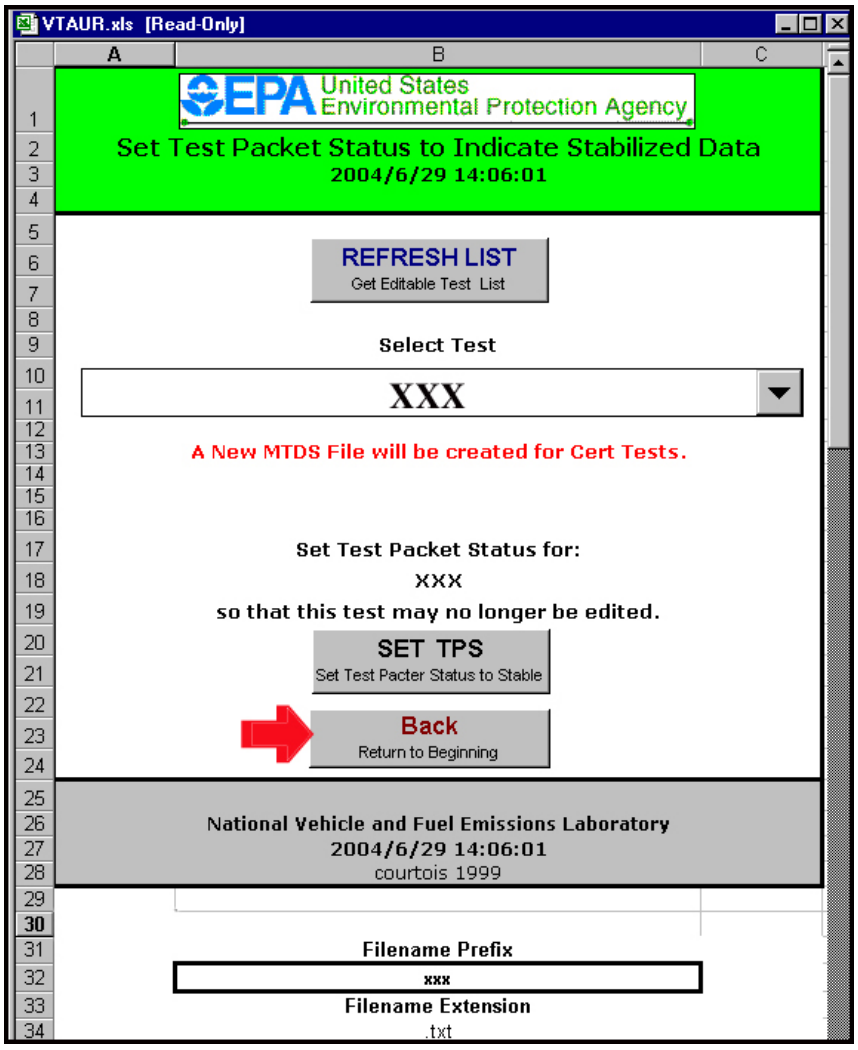


Figure 46

816 The "Test Data Entry & Update Programs" screen will appear. Click on the "Back" button. See the arrow in Figure 47.

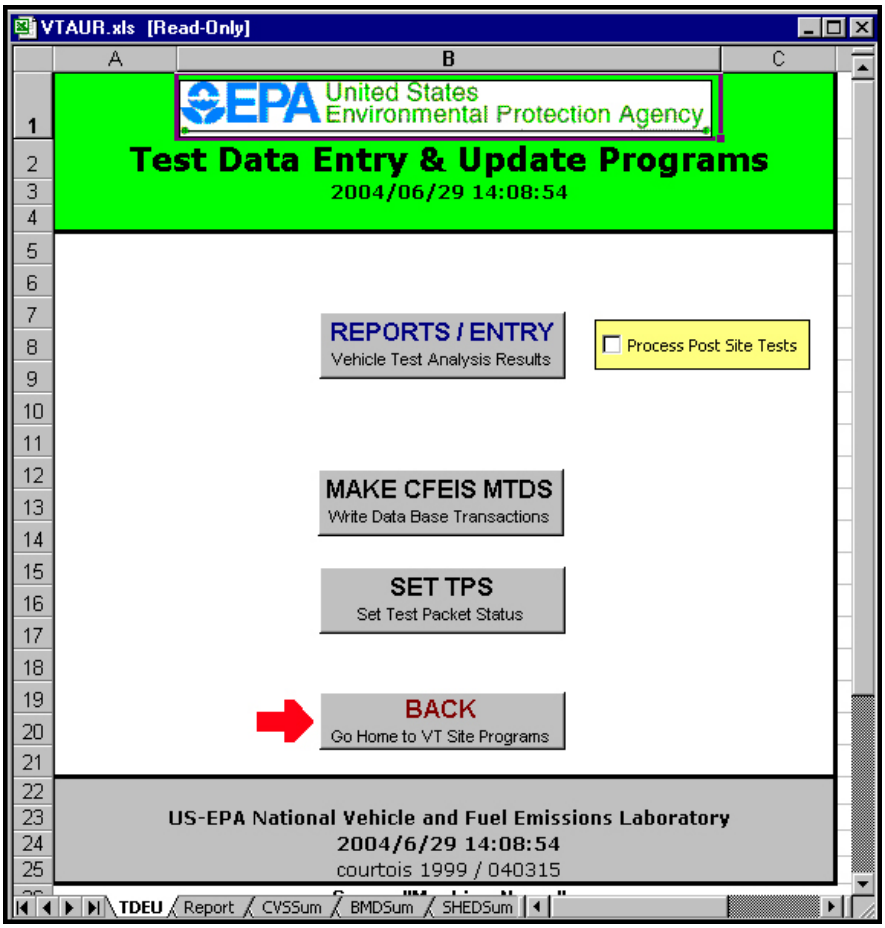


Figure 47

617 The "Vehicle Test Site Programs" screen will appear. Click on the "Back" button. See the arrow in Figure 48.

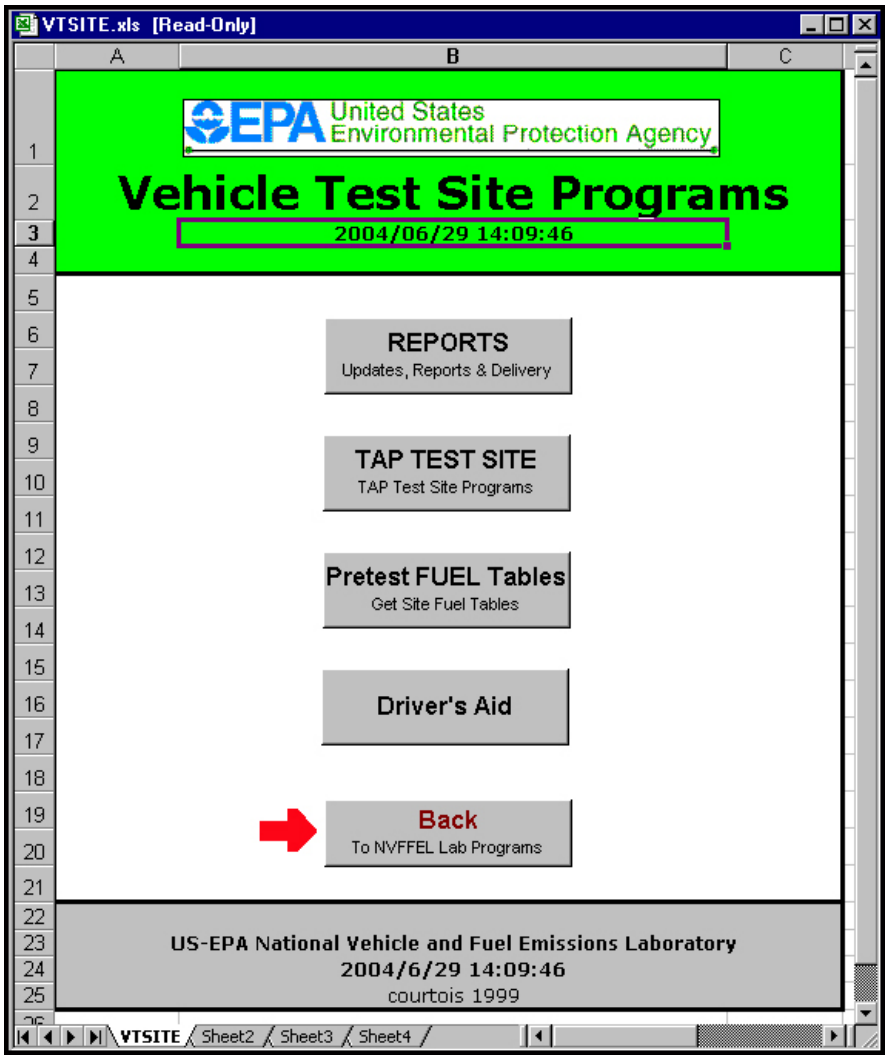


Figure 48

618 The "NVFEL Laboratory Programs" screen will appear. Click on the "OFF-SITE PROCESSING Historic Test Reporting" button. See the arrow in Figure 49.

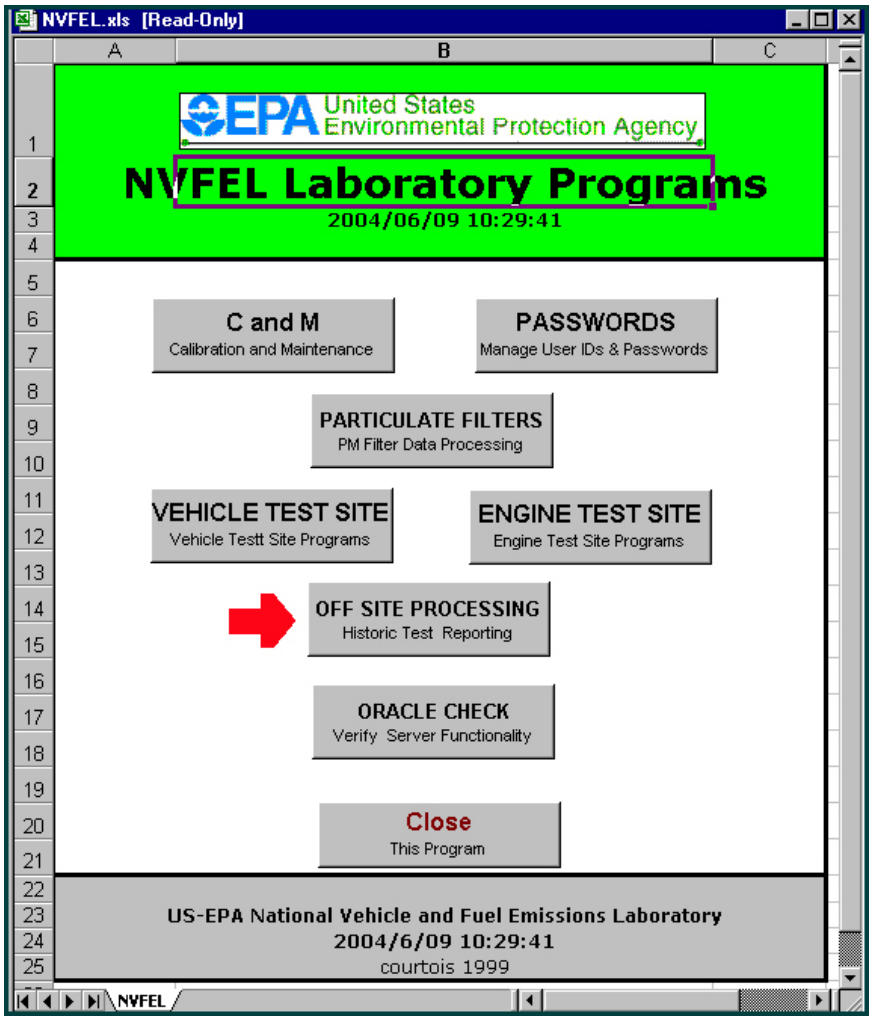


Figure 49

619 The "Post Test Data Processing" screen will appear. Click on the "REPORTS Test Data Analysis Reports" button. See the arrow in Figure 50.

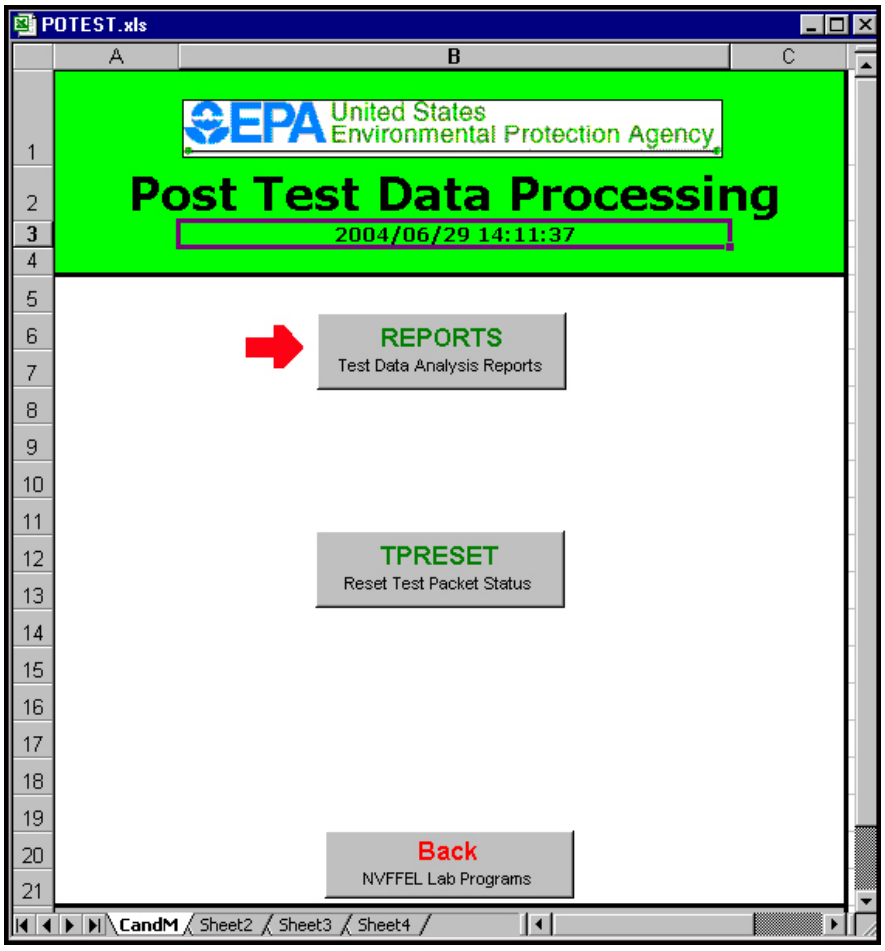


Figure 50

620 The "Off Site Test Data Analysis Programs" screen will appear. Click on the "REPORTS/ENTRY Vehicle Test Analysis Results" button. See the arrow in Figure 51.

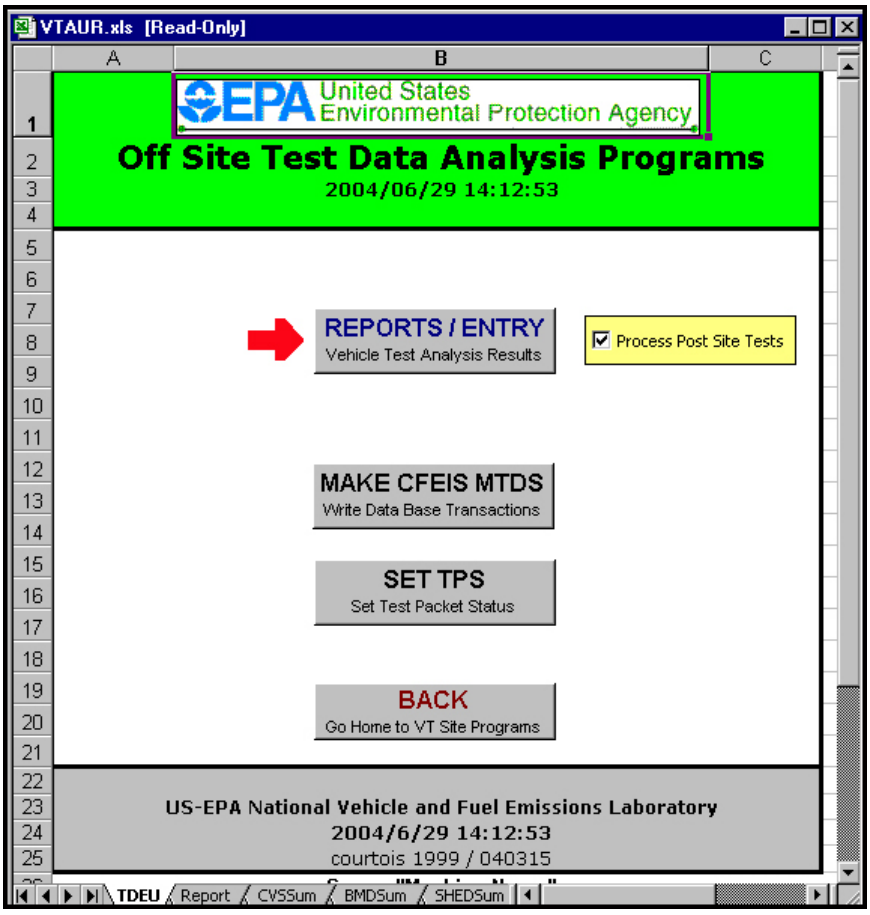


Figure 51

621 The "Generate Vehicle Test Analysis Reports" screen will appear. Click on scroll arrow. See the arrow in Figure 52. Scroll to and click on the appropriate test number. Wait for the program to automatically generate the "NVFEL Laboratory Test Data Final Laboratory Test Results."

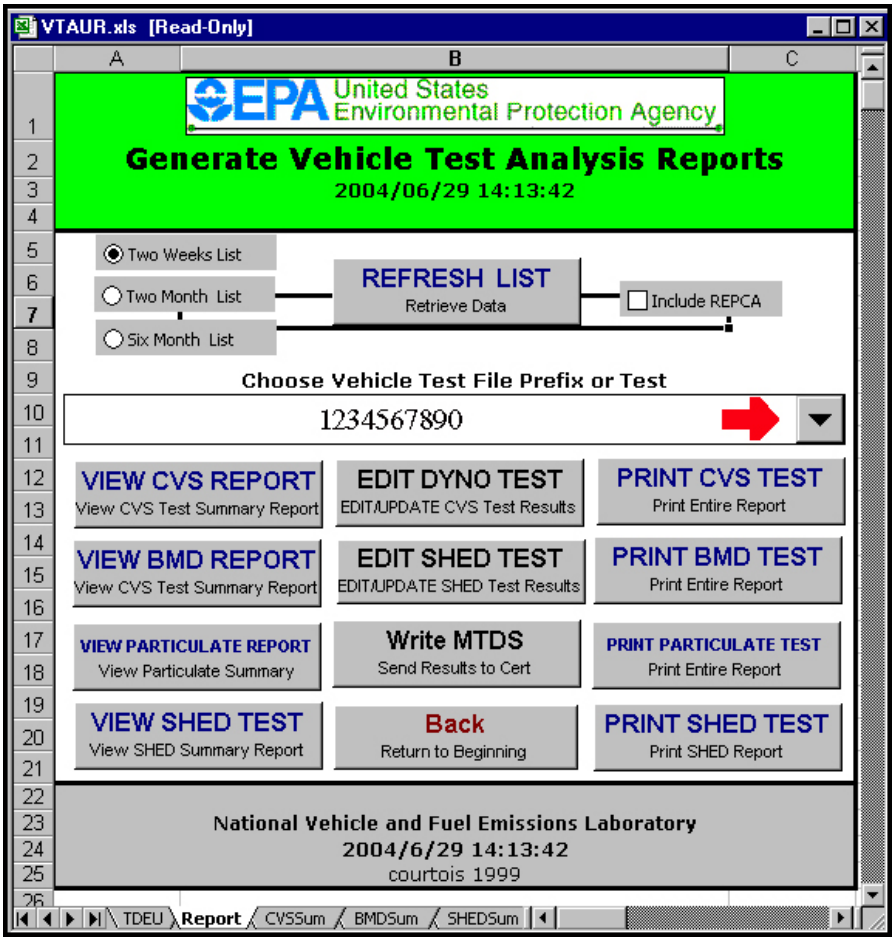


Figure 52

622 When the "NVFEL Laboratory Test Data Final Laboratory Test Results" screen appears, click on the "Back Return to the Report Selection" button. See the arrow in Figure 53.

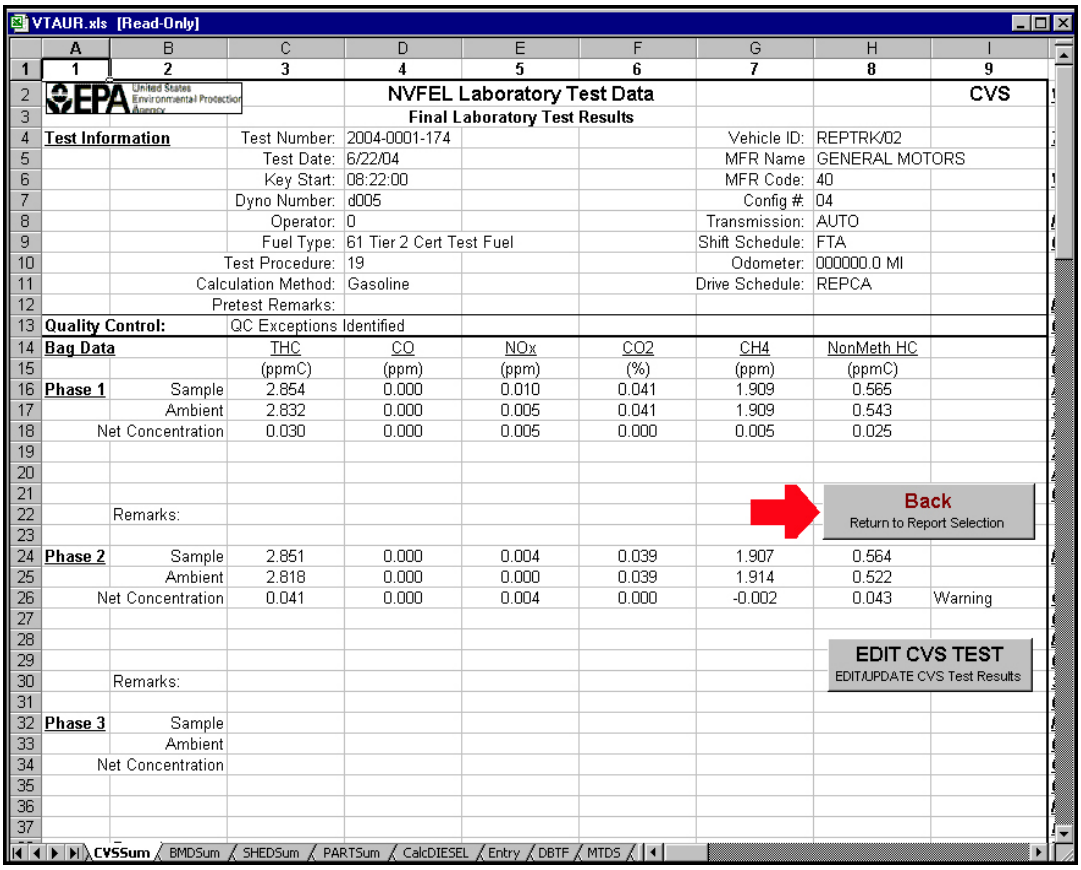


Figure 53

623 When the "Generate Vehicle Test Analysis Reports" screen appears, click on the "PRINT CVS TEST Print Entire Report" button. See the arrow in Figure 54.

Click on the button once for each full report needed.

Distribute the printed reports as necessary.

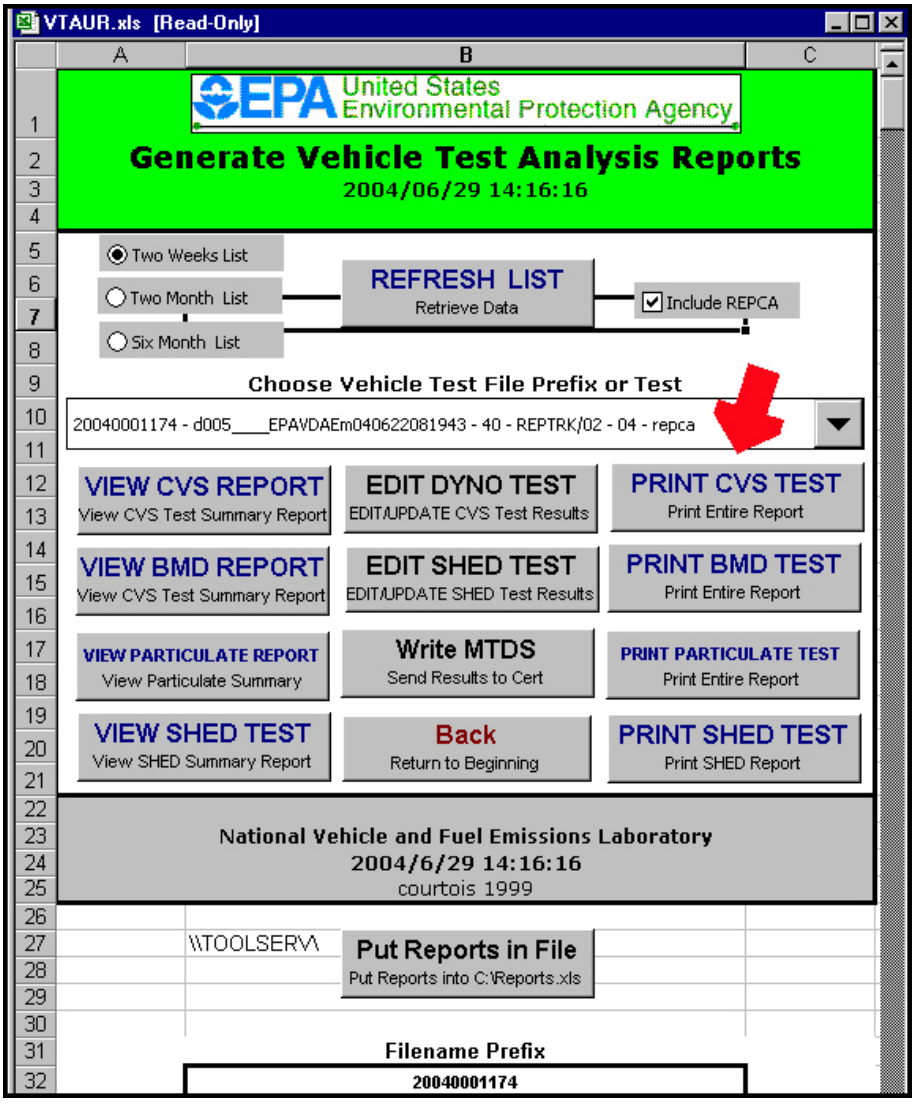


Figure 54

624 Exit the Microsoft Excel program. When the dialog box appears asking, "Do you want to saveÖ .," Click on the "No" button.

9. Data Input

9.1 The following information will automatically appear in the VDA vehicle test information dialog box when the test is selected:

Test number

Vehicle manufacturer (Mfr.)

Vehicle identification number (Veh ID)

Test Type

Test Procedure (Test Proc)

Test Schedule (Test Sch)

Shift Schedule (Shift Sch)

Drive Schedule (Drive Sch)

9.2 The driver enters the following information on the VDA test information dialog box:

Equivalent Test Weight (Eq Test Wgt)

The letters "COEF" for the 48" single-roll electric dynamometer

Driver Identification Number (Driver ID)

Dynamometer Site Number (Dyno Site)

9.3 The driver enters comments on the VDA driver's trace, for example WOT, stall, stumble, hesitation, trace spikes, and late or missed shifts.

9.4 The driver enters the following information on the CDTCS:

Vehicle odometer

Driver ID number

Interia weight

Indicated dyno horse power (IndDynHp)

Drive tire pressure

If a side fan is used enter "Yes" for side fan and position

If the operator ID is different than the driver ID

Remarks

9.5 On Form 700-03, the driver verifies "Vehicle ID" and the "Test Number" are correct. They also record the last dyno usage and complete the required checks. When completed they record their EPA ID number and the date.

9.6 If a vehicle is tested without a test number the technician will enter the vehicle ID and dyno number in the CDTCS.

9.7 The driver enters the following on the "Vehicle Simulation Parameters" screen of the RTM-200 computer (if not already entered):

Test number

Vehicle ID number

Inertia (ETW)

A, B, and C coefficients

9.8 The driver obtains a "DYNAMOMETER REPORT" printout including a plot of simulation error.

10. Data Analysis

The validation technician should be familiar with this procedure and should not have performed any of the preceding steps.

10.1 Review the VDA "Summary Report."

10.1.1 Verify that the following information agrees with the VSR:

Vehicle manufacturer (Mfr.)

Vehicle identification number (Veh ID)

Version

Test Type

Test Procedure (Test Proc)

Shift Schedule (Shift Sch)

Equivalent Test Weight (Eq Test Wgt)

The letters "COEF" for the 48" single-roll electric dynamometer)

10.1.2 Verify that all out-of-tolerance events have been addressed and the "STARTUP" times are less than 10 seconds.

10.1.3 If there are no omissions, inconsistencies, or errors on the VDA "Summary Report," enter your technician ID number and the date in the designated spaces.

If there are omissions, inconsistencies, or errors on either the VDA "Summary Report," notify a senior technician.

10.2 Review Form 700-03 and verify that all spaces have been checked, the drivers ID number and date have been entered. Verify that the Vehicle ID # and Test Number correspond to the VDA "Summary Report":

If there are no omissions, inconsistencies, or errors on the form, enter your technician ID number and the date in the designated spaces.

If there are inconsistencies or errors on the form, notify a senior technician.

10.3 Review the CDTCS Preliminary Laboratory Test Report.

10.3.1 Verify that the dyno and vehicle ID information agree with the VDA summary report to ensure that the correct test number was assigned to the dyno.

10.3.2 Verify that the key start time is within 12 to 36 hours from the prep key off time.

10.3.3 Verify that the fuel type corresponds to the fuel type recorded on the "Test" fuel ticket.

10.3.4 Verify that the correct inertia weight and horsepower have been entered.

10.3.5 Verify that all samples were read within the 20-minutes.

10.3.6 Verify that the cranks times are less than 10 seconds.

10.3.7 For Fuel Economy Data Vehicles only, ensure that the dew-point is between 42-52 ^{o}F.

If the dew-point exceeds these tolerances, use the dew-point and barometer values and calculate the specific humidity using the Excel "Humidity Calc. 3.0" program. Ensure the specific humidity is 30-70 gr./lb.

If it is not, the test is void.

10.3.8 If all items comply with the requiements in Steps 103.1 through 10.3.7, write "OK," your technician ID number, and the date at the bottom of the report

If all items do not comply, contact a senior technician.

10.4 Verify that the following information on the DYNAMOMETER REPORT is correct:

The inertia (ETW) and the A, B, and C coefficients correspond to the VSR.

The average positive simulation error is less than 0.05% and the average negative simulation error is less than -0.05%.

If there are no omissions, inconsistencies, or errors on the Dynamometer Report, enter your technician ID number and the date on the report. If there are omissions, inconsistencies, or errors on the Dynamometer Report, notify a senior technician.

11. Data Output

11.1 Place Form 700-03 in the Test Packet.

11.2 Give the "Preliminary Laboratory Report" to the vehicle manufacturer.

11.3 The following 48" single-roll electric dynamometer printouts are generated:

11.3.1 Print of the screen following automatic calibration of the 48" single-roll electric dynamometer when adjustments of the 5 mph "OFFSET" and/or adjustments of the + and - "SHUNT" values are made. The printout is forwarded to the senior technician.

11.3.2 Test report following parasitic losses calibration of the 48" single-roll electric dynamometer, when a parasitic loss curve is updated. The report is forwarded to the senior technician.

11.3.3 "DYNAMOMETER REPORT" printout including a plot of average simulation error. This report is placed in the test packet.

12. Acceptance Criteria

The following criteria must be met for the FTP to be valid:

121 Vehicles tested according to the 1978 test sequence and not scheduled for evaporative emissions testing shall be placed on a dynamometer and the engine started for the "Exhaust Emission Test" procedure within 1 hour of completion of the diurnal heat build.

12.2 The test vehicle must not exceed the ambient temperature tolerances of 68-86 ^{o}F and the average dew-point temperature must be within 35-55 ^{o}F. The dew-point limits are for Fuel Economy Vehicles only.

12.3 The vehicle shall have been soaked for not less than 12 hours nor more than 36 hours prior to the start of the cold-start exhaust emission test.

12.4 For 1996 test sequence vehicles being tested for evaporative emissions, the evaporative canister must be preconditioned during the 12- to 36-hour soak period.

12.5 Ambient temperatures encountered by the test vehicle must remain within 68-86 ^{o}F at all times.

12.6 The VDA trace must be within the following UDDS speed tolerances:

12.6.1 The upper limit is 2 mph higher than the highest point on the trace within 1 second of the given time. The lower limit is 2 mph lower than the lowest point on the trace within 1 second of the given time.

12.6.2 Speed variations greater than the tolerances (such as may occur during gear changes, etc.) are acceptable provided they are less than 2 seconds in duration.

12.6.3 Acceptable speed variations may occur during gear changes, brake spikes, engine stumbling, etc.

12.6.4 Speeds lower than those prescribed are acceptable, provided the vehicle is operated at maximum available power during such occurrences.

12.7 The dynamometer inertia simulation must be set to the exact inertia value specified for the vehicle on Form 700-03.

12.8 The 48" single-roll electric dynamometer must be set to the correct inertia and A, B, and C coefficients as specified on Form 700-03.

12.9 The 48" single-roll electric dynamometer average positive simulation error must be less than 0.05% and the average negative simulation error must be greater than -0.05%.

12.10 The driver shall have turned the ignition key on and started cranking the engine for the hot start test between 9-11 minutes after the end of the sample period for the cold-start test.

12.11 Every range used for exhaust sample analysis must have span and zero verification checks.

The zero checks must be within ±2% of full scale (FS) from the zero set-point that preceded the analysis.

The span checks must be within ±2% of FS from the span set-points that preceded the analysis.

12.12 Exhaust sample bags must be analyzed within 20 minutes of the end of the bag fill time for each phase of the test. Automatic bag timers monitor the elapsed time between completion of the sample collection and completion of the sample analysis and are reported on the Preliminary Laboratory Report.

13. Quality Provisions

13.1 The technician follows the sequence of steps on Form 700-03, recording data as needed.

13.2 The dynamometer inertia weight is verified by another technician other than the driver.

13.3 The 48" single-roll electric dynamometer vehicle/dyno class, inertia, and A, B, and C coefficients are verified by another technician other than the driver.

13.4 The 48" dyno is made ready for testing by following the 48" single-roll electric dynamometer prep sequence.

13.5 The 48" single-roll electric dynamometer is self-checked during the warm-up.

13.6 If the automatic calibration procedure on the 48" single-roll electric dynamometer results in an update of the "OFFSET" or "SPAN" values, a new parasitic loss curve is run.

13.7 If the parasitic losses calibration procedure on the 48" single-roll electric dynamometer results in a change in parasitic loss at any speed point exceeding 1.0 lb. and, if the curve fit r^2 value is 0.996 or greater, the new losses curve is accepted.

13.8 The technician's identification number must appear on all forms and test records, certifying that the data are accurate and complete.

13.9 If the vehicle soak has exceeded the 3 hour limit since the completion of the FTP, it will be preconditioned by operation through one cycle of the UDDS prior to the start of the HFET. If the vehicle has been moved outdoors, or to environments where the soak temperature is not controlled, it will be soaked at 68-86 ^{o}F for a minimum of 4 hours prior to performing the preconditioning UDDS.

13.10 Deviations from this procedure are documented on Form 902-01. In general, these deviations will void the data. However, the customer may choose to accept the data as variant. To do this, the customer must indicate acceptance by signing and dating Form 902-01.

Attachment A

Preconditioning and Sample Collection

Vehicle ID # Test Number

Fuel Type: Volume:

Equivalent Test Weight: pounds Actual Dyno HP: Hp

Manf. Set Coefficient A: Manf. Target Coefficient A:

Manf. Set Coefficient B: Manf. Target Coefficient B:

Manf. Set Coefficient C: Manf. Target Coefficient C:

Target Coastdown time: Shift Schedule

Fan Placement:

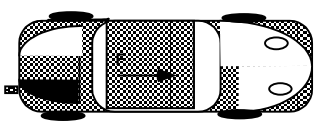
Additional Fan Placement:

Drive Code: Set Tire Pressure to:

Vehicle Preconditioning

_____ The tire pressure set @ _____ psi.

_____ Hood is open, fan(s) is (are) positioned within 12 inches and operational. Indicate the placement of the fan(s) below:



Record odometer on Form 700-01, Test Parameters

Sample Collection

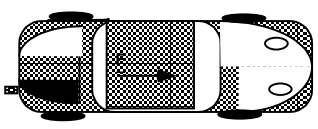
Twin Roll Dyno - Record last dyno usage time: _____

_____ Electric Dyno has been warmed and calibrated today

_____ The tire pressure set @ _____ psi.

_____ Noresco controller is in the "TEST" mode. Temp and dewpoint within tolerance..

_____ Hood is open, fan(s) is (are) positioned within 12 inches and operational. Indicate the placement of the fan(s) below:



I have performed all steps in accordance with the requirements of Test Procedure 700.

Technician's ID _____ Date _____

Attachment B

Horiba MEXA / CVS / CDTCS Shutdown and Start-up Sequences

If you suspect that the system is not communicating with CDTCS you may not need to do a total shut down. Keep the CDTCS Computer power on and shut down the equipment you are having trouble with. EXAMPLE: If the CVS is not communicating with the CDTCS you can shut this down and then power up. If the problem continues include Steps 8 through 11 of the shutdown process.

Shutdown Sequence: Steps 8 through 11 are needed only for total power shutdown

1. (Test Cell) - Turn off the CVS Main Power.
2. (Test Cell) - Turn off the MEXA 7200 Power Supply Unit - Main Power.
3. (Test Cell) - Turn off the LAN/HP-1B Gateway transceiver by turning off the power strip.
4. (Control Room) - Select MEXA computer shutdown command.
5. (Control Room) - MEXA displays "LynxOS is down," turn off the Venturis FX computer
6. (Control Room) - Under "File" on the CDTCS computer select the shutdown command.
7. (Control Room) - When the blue Horiba Logo appears, shut off the Hewlett Packard computer.
8. (Control Room) - Turn off the external hardrive on top of the Hewlett Packard computer.
9. (Control Room) - Microsoft NT computer software shutdown.
10. (Control Room) - Microsoft NT computer power off.
11. (Control Room) - EPA Hub.

Startup Sequence: Steps 1 and 2 are needed only if a total power shutdown was performed.

1. (Control Room) - Turn on the EPA Hub (only if shut off in total shutdown).
2. (Control Room) - Turn on the Microsoft NT Host (only if shut off in total shutdown).
3. (Test Cell) - Turn the LAN/HP-1B Gateway transceiver on by turning the power strip on. Verify that the LAN and HP-1B yellow lights are illuminated.
4. (Test Cell) - Turn on the MEXA 7200 Power Supply Unit - Main Power.
5. (Test Cell) - Verify that the IFC - OPE light is at a single rhythmic blinking pace before proceeding similar to that OPE light on the SVS unit.
6. (Test Cell) - If OPE light is at a single rhythmic blinking pace, turn on the CVS Main Power.
7. (Control Room) - Turn on the MEXA Venturis FX Computer. Wait until all analyzers appear.
8. (Control Room) - In the upper right corner of the MEXA screen, select "STANDBY".
9. (Control Room) - Turn on the external hardrive (on top of the Hewlett Packard computer).
10. (Control Room) - Turn on the CDTCS Hewlett Packard computer.
11. (Control Room) - When the blue Horiba logo appears, enter "dyno" as the user and push enter.
12. (Control Room) - Click on enter again. No password is needed.
13. (Control Room) - When the "Starting Trace Manager" appears window, the start-up is completed.
14. (Test Cell) - On the LAN/HP-1B Gateway, verify that all of the yellow lights are flashing. If they are not, you will not be able to run any tests. Identify the problem and repeat the shutdown and startup sequences.

Attachment C

Horiba MEXA Analyzers Span Point Change

Anytime a span bottle is replaced, a new concentration for that bottle must be recognized. To do this you must be in the "Supervisor" mode.

1. Under the Horiba logo, select "SUPERVISOR". Type in the password.
2. If not in the "Utility" mode, select "Utility" under the "Menu" button.
3. Click on the "Check / Tests" button and select "Linearize"
4. When the "Analyzer Linerization" panel appears, click on "Individual"
5. Select the "Component" (gas) and the "Range" of the bottle you are naming.
6. Click on the "Span Bottle Naming" button and the "Span Bottle Naming" panel will appear.
7. Enter the bottle named concentration by clicking on the yellow numbers displayed in the "Span gas conc." field.
8. Press the "Read Counts" button. When completed the "Span Bottle Naming" panel will appear.
9. If the measured concentration is within 1.0 percent of the bottle concentration, click on the "OK" button. If not, notify the Gaslab. To exit without saving the changes, click on the "Cancel" button.

Alternative to changing Bottle Concentration.

1. Press the button for the desired analyzer (CO,CO2,HC,NOx, or Methane) in the display area of the basic panel.
2. Select the "Set span" option from the pop-up menu.
3. The values for ranges and spans are displayed. Edit any value that is displayed in yellow by clicking on the number and using the keypad, enter the bottle concentration.
4. Click on the "OK" button to save changes and close the panel. To exit without saving the changes, click on the "Cancel" button.

Attachment D

Horiba CVS Filter Change

SHS Filters

Oil catcher

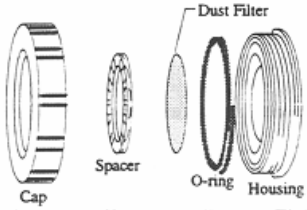
Check to see that the oil catcher filter is installed properly.

Make sure the filter has the correct orientation.

For EGR sample lines, the orientation of the oil catcher filter is opposite of the picture above. To replace the oil catcher filter, set a valve at the oil catcher side to 'close'.

Dust filter

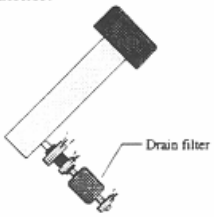
Check to see that the cylindrical dust filter is installed properly. The cap should be fastened tightly so that the O-ring seal is visible. If the O-ring is not installed properly, NOx, THC and O2 leaks may occur. On the sample filter, Horiba logo is printed. Turn the filter so that you can see the logo through the cap. Replace the filter when the Horiba logo is no longer visible.



Note: The leakage from the filter unit affects the indication. Tighten the filter firmly.

Drain pump preservation filter

Check that the drain pump preservation filter is in place. Replace the filter when you can detect excess moisture in the oil catcher.



Air filter

Check that the air filter element is in place. Replace if dirty.

When using shop air, check the air filter and mist separator filter. Drain accumulated moisture and replace when needed.

Attachment E

Video Drivers Aid Operation

1.0 VDA System: To operate the VDA, you may need to view MacAcademy's "Basic Macintosh" videotape, which is a self-taught course explaining the operation of the Macintosh personal computer. The following is a brief summary of techniques needed to use the mouse.

1.1 To operate the Mouse: Move the mouse around on a flat surface to position the pointer on the VDA screen. When you move the mouse, the pointer on the screen moves correspondingly.

1.2 To Click**:** Position the pointer on what you want to select or make active. Press and quickly release the mouse button.

1.3 To Double Click**:** Position the pointer on your selection. Press and release the mouse button twice in quick succession.

1.4 To Press**:** Position the pointer on a menu title. Without moving the mouse, press and hold the mouse button.

1.5 To Drag: Position the pointer on your selection. Press and hold down the mouse button and move the mouse to the new destination. Release the mouse button.

1.6 To Add Comments**:** Press <~>. This will flag the data for entry of a comment at a time convenient for the driver.

2.0 To start the VDA, enter the test cell and turn the video monitor power switch "ON." The control dialog box will appear at the bottom of the VDA screen, see below.

Control dialog box

Attachment E Continued

3.0 The following is a list of the computer keyboard commands that are accessed by simultaneously using the command key with another key. The computer operations performed are listed below each combination.

The symbol for the command key is ⌘

⌘ S	⌘ Space Bar	⌘ K
Start cranking	**Hold cranking**	**Kill**
Start scrolling	**Hold scrolling**	
Try again		

4.0 Return to the control room and turn the hard disk computer drive (lower unit) power switch on, wait 15 seconds, then turn the Macintosh Computer power switch on. The computer will beep and an icon representing a floppy disk will appear on the screen. See Figure 1.

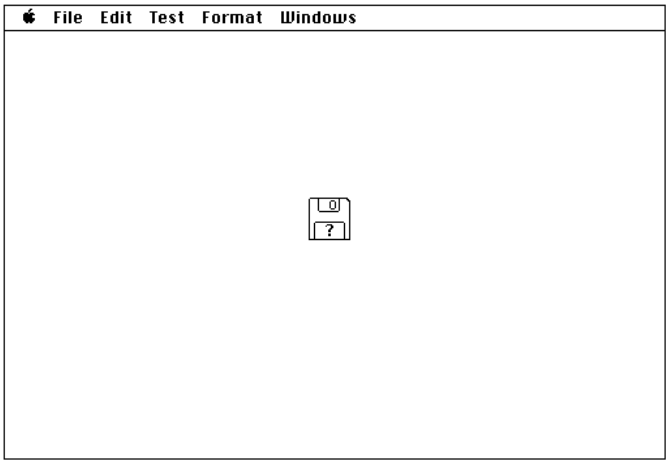


Figure 1

5.0 The message "Connect to the file server "LNS Production Server" as: Registered User" will appear. See Figure 2. The dyno number will be displayed in the "Name" box. Type in the correct password and select the "OK" button.

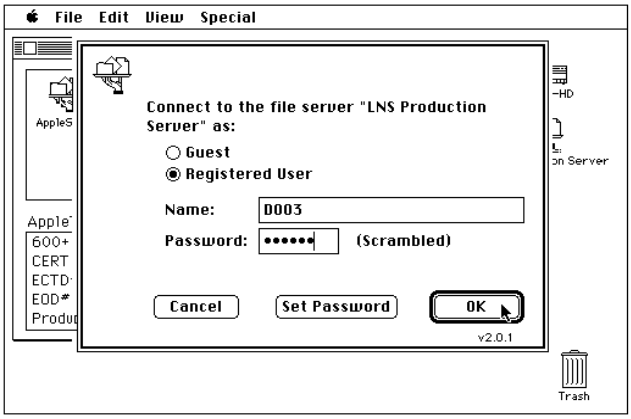


Figure 2

Attachment E Continued

6.0 The clock synchronization program will automatically run and set the clock.

7.0 The "LNS Production Server" icon will appear. Position the mouse pointer on the icon and double click to open it. See Figure 3.

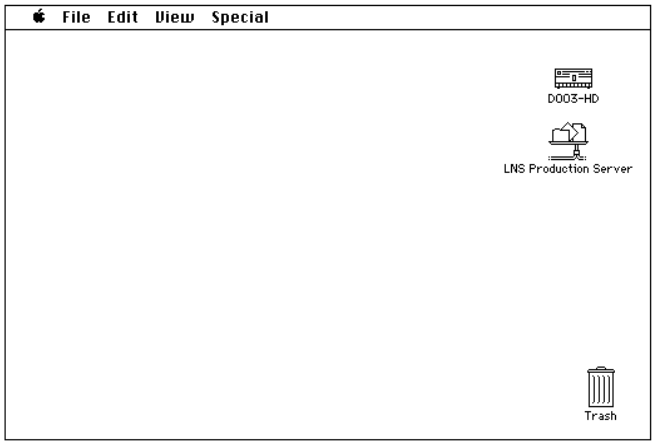


Figure 3

8.0 Position the mouse pointer on the "VDA" folder and double click to open it. See Figure 4.

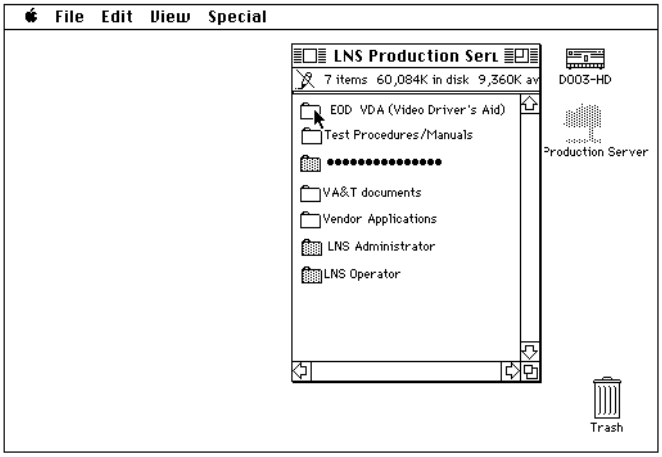


Figure 4

9.0 If an incorrect folder is selected, position the mouse pointer on the correct folder and select it. If an incorrect folder is opened, position the mouse pointer on the "Close" box in the upper left corner of the window and click to close it. Position the mouse pointer on the correct folder and double click on it.

Attachment E Continued

10.0 Preps:

10.1 Position the mouse pointer on the "2-PREPS to be done" folder and double click to open it. See Figure 5.

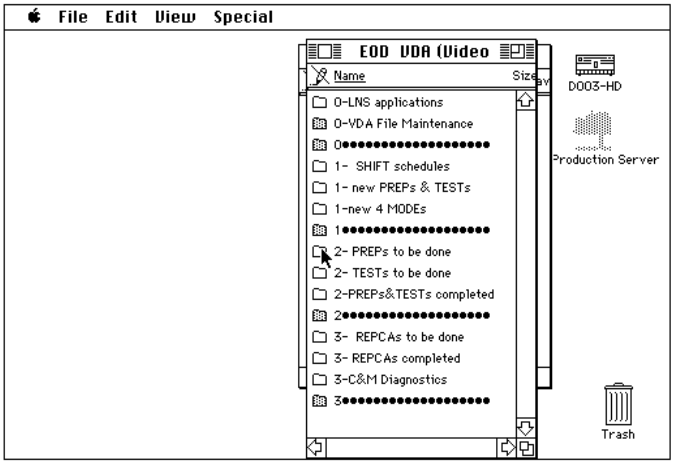


Figure 5

10.2 Position the mouse pointer on the "Preps" folder for the applicable day of the week and double click to open it (this example is for Monday). See Figure 6.

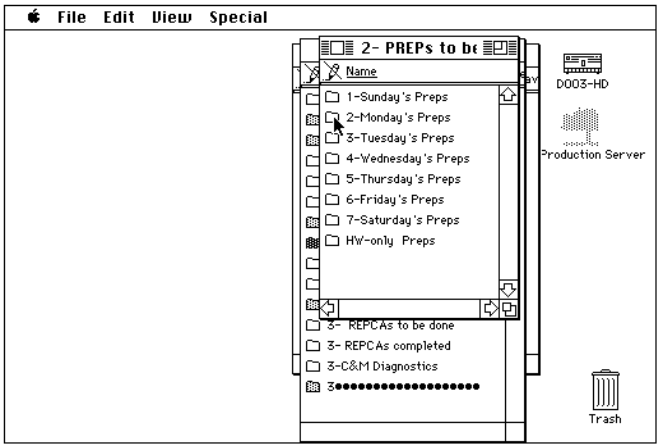


Figure 6

Attachment E Continued

10.3 Position the mouse pointer on the appropriate test number and double click to open it. See Figure 7. If the test number cannot be located, contact the senior technician.

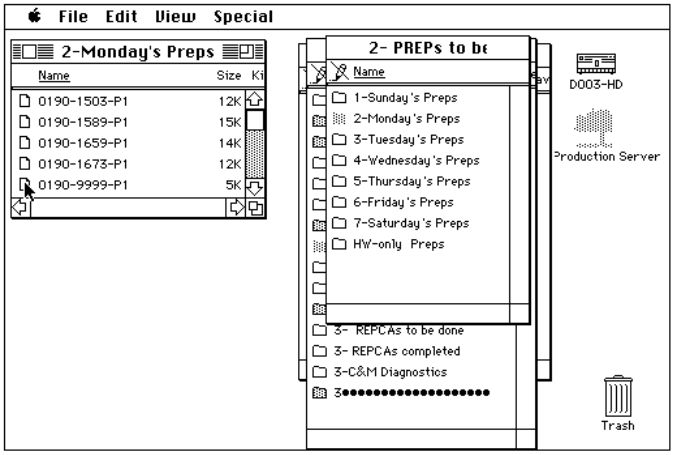


Figure 7

11.0 For FTP Tests:

11.1 Position the mouse pointer on the "2-TESTs to be done" folder and double click to open it. See Figure 8.

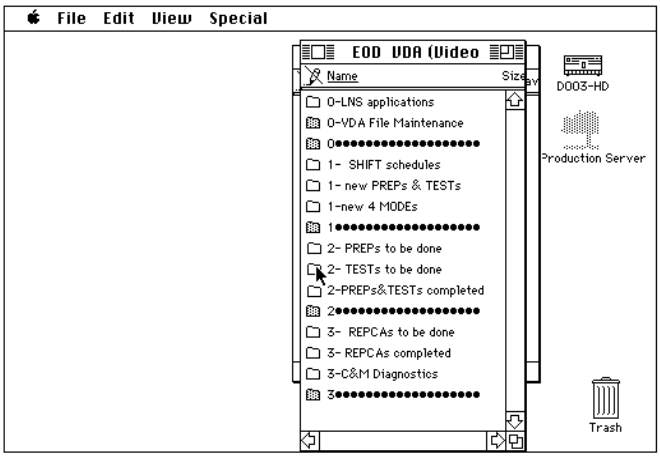


Figure 8

Attachment E Continued

11.2 Position the mouse pointer on the tests folder for the applicable day of the week and double click to open it (this example is for Tuesday). See Figure 9.

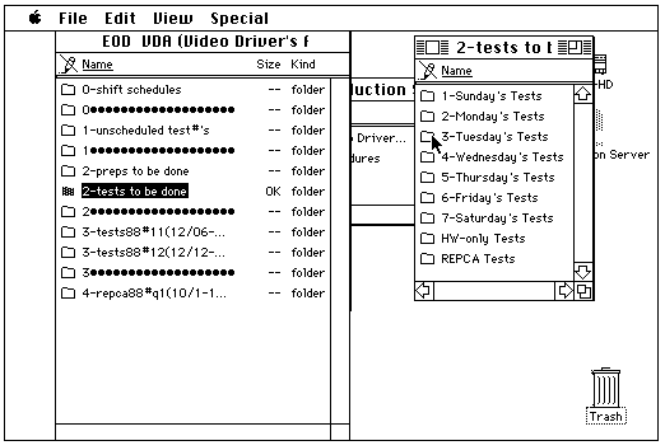


Figure 9

11.3 Position the mouse pointer in daily tests window on the appropriate test number and double click to open it . See Figure 10. If the test number cannot be located, notify the senior technician.

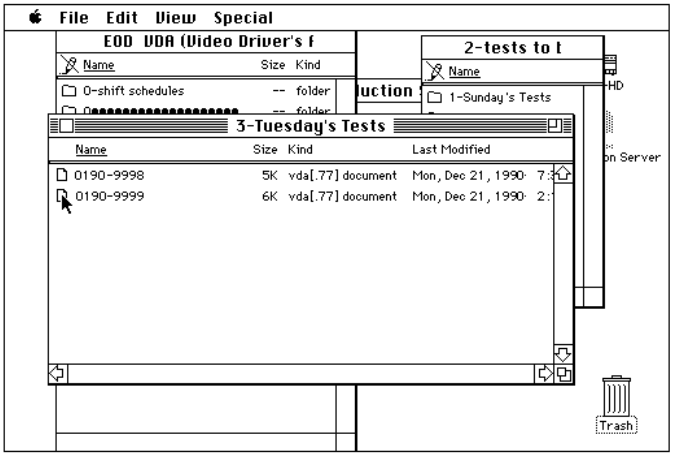


Figure 10

Attachment E Continued

12.0 For Highway Tests:

12.1 Position the mouse pointer on the "2-TESTs to be done" folder and double click to open it. See Figure 11.

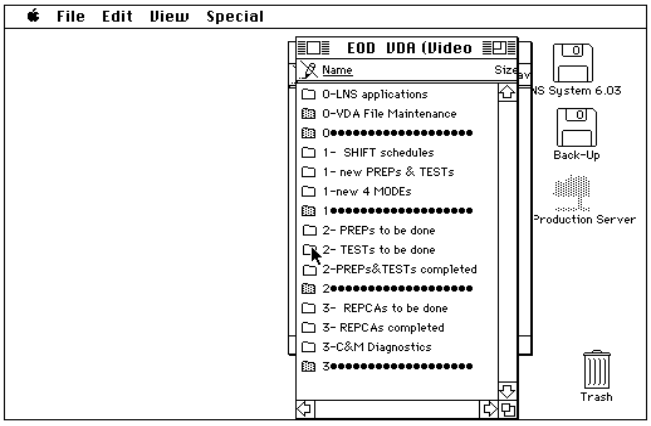


Figure 11

12.2 Position the mouse pointer on the tests folder for the applicable day of the week and double click to open it (the following example is for HW-only Tests). See Figure 12.

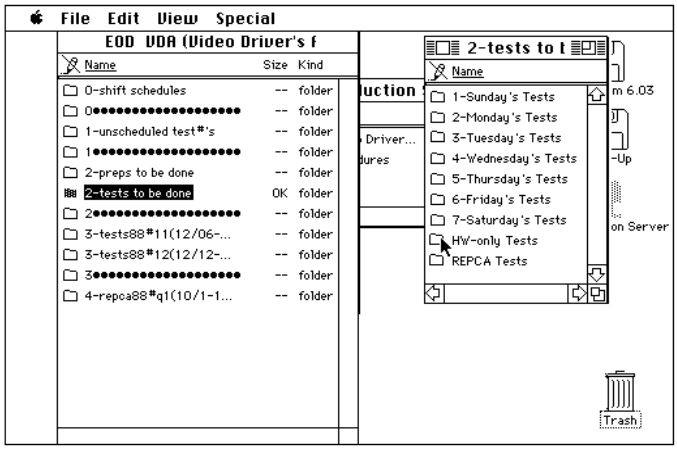


Figure 12

Attachment E Continued

12.4 Position the mouse pointer in the daily tests window on the appropriate test number and double click to open it. See Figure 13. If the test number cannot be located, notify the senior technician.

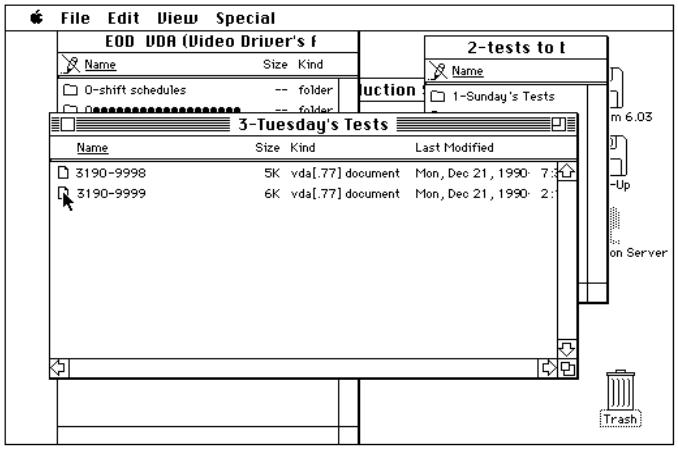


Figure 13

13.0 The notice "Please wait while test # is being expanded" will momentarily appear on the VDA screen.

14.0 If the warning "Dyno interface device is off, inoperative, or missing" appears on the screen, contact the Computer Room for assistance. See Figure 14.

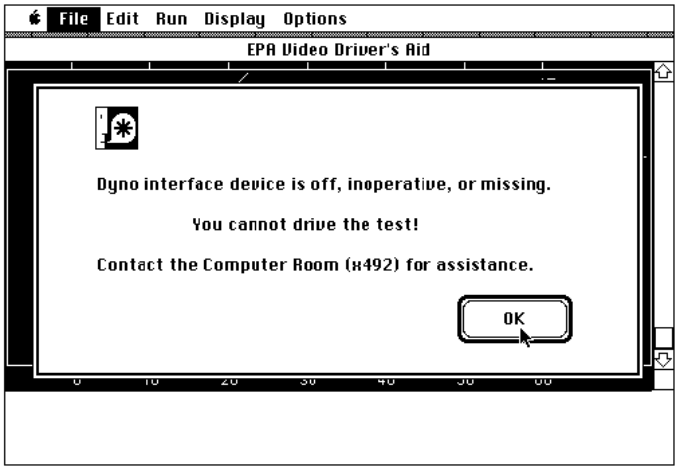


Figure 14

Attachment E Continued

15.0 Check the information in the "Vehicle Information Dialog Box" against the data on Form 700-03. See Figure 15. If the data are not correct, contact the test scheduler.

If the test data are correct, enter the following in the appropriate boxes:

"Equivalent Test Weight"

"Indicated Dyno HP" for twin-roll hydrokinetic dyno, or the letters "COEF" for 48" single-roll electric dyno

"Driver's ID"

"Dyno Site"

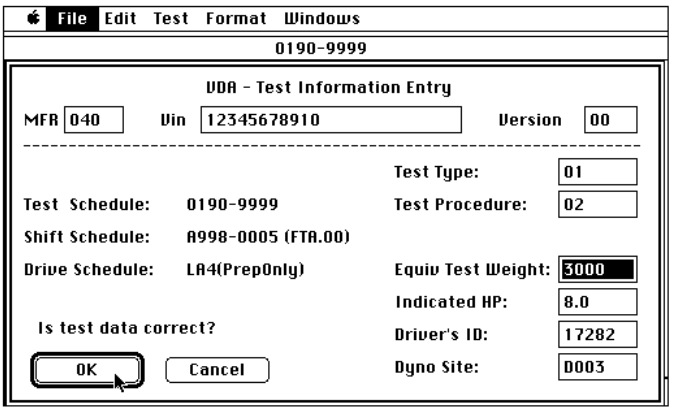


Figure 15

16.0 Position the mouse pointer on the "OK" button and click on it.

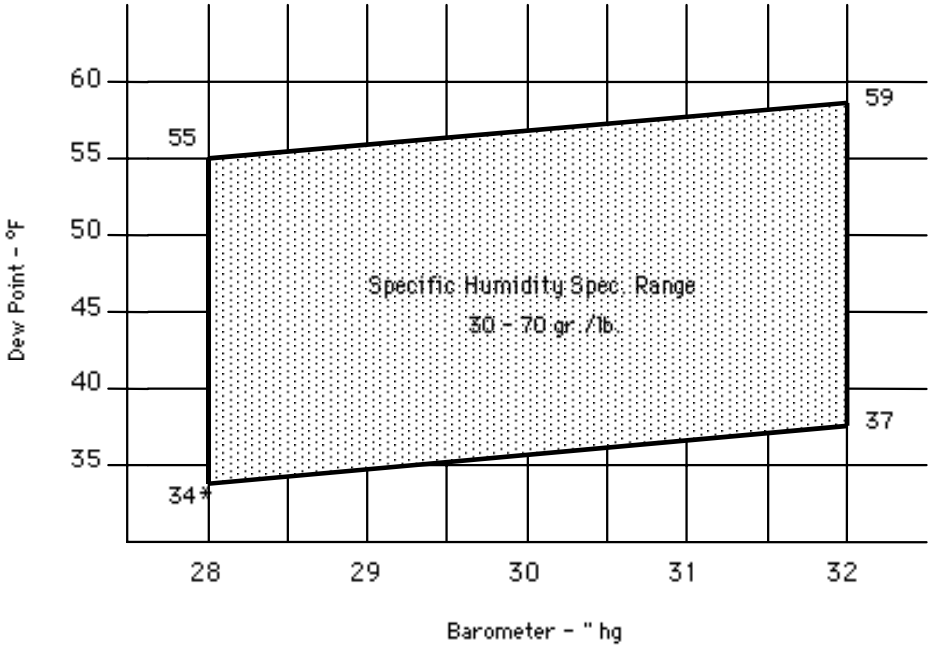
When the VDA program is activated and the correct data have been entered, place a checkmark in the proper space on Form 707-01.

Attachment F

Specific Humidity Specification Range for Fuel Economy Test

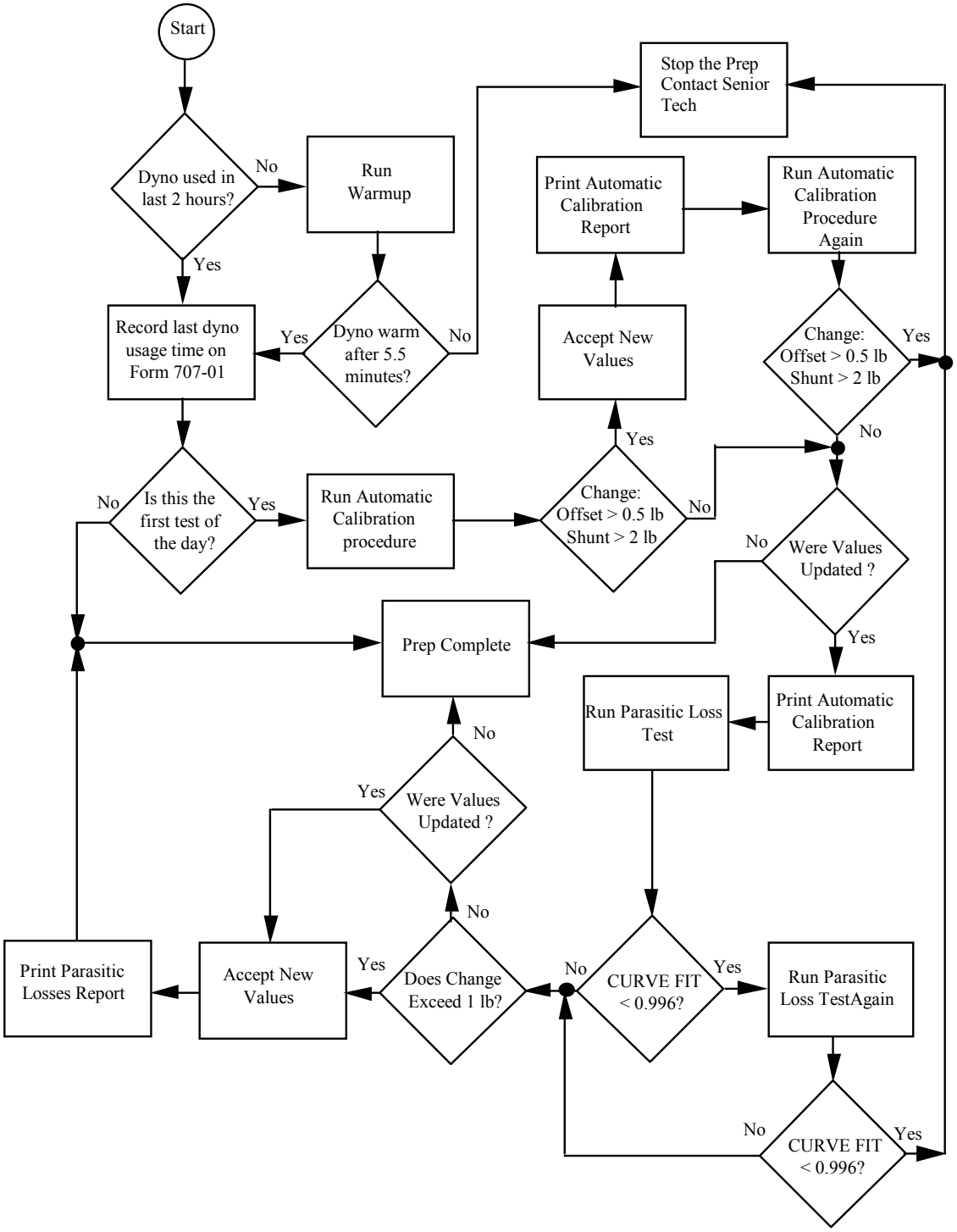
The endpoints of the dew-points are listed on the corners of the spec. range. * If you obtain a reading of 34 F or less on the dew-point hygrometer, contact a senior technician.

The boundaries for this graph are not exact. If you are not certain that a test was performed within the specific humidity range, contact a senior technician.



Attachment G

Single-Roll Dyno Warmup Flow Chart



Attachment H

Horiba Electric Dynamometer Automatic Calibration Report

HORIBA ELECTRIC DYNAMOMETER
CDC-900
AUTOMATIC CALIBRATION REPORT

TEST SITE: DOO5 END DATE: Mar 29 1995
ARCHIVE REC: 9999 END TIME: 20:39:20

LOSSES REC: 228

COMMENT:

DIRECTION: FORWARD

OFFSET READING SPEED: 5.00 MPH

	PREVIOUS	MEASURED	CHANGE
OFFSET:	-0.75 LBS	-1.00 LBS	-0.25 LBS
+SHUNT:	1753.0 LBS	1753.1 LBS	0.1 LBS
+SPAN :	0.2380	0.2380	-0.0000
-SHUNT:	-1755.0 LBS	-1754.9 LBS	0.1 LBS
-SPAN :	0.2382	0.2382 LBS	0.0000

Attachment H Continued

HORIBA ELECTRIC DYNAMOMETER
CDC-900
PARASITIC LOSSES REPORT

TEST SITE: DOO5 END DATE: Mar 29 1995
ARCHIVE REC: 999 END TIME: 20:39:20

PREV LOSS REC: 228

COMMENT:

DIRECTION: FORWARD

SPEED MPH	LOSSES LBS	CHANGE LBS
5	0.1	-0.1
10	0.3	-0.3
15	0.4	-0.6
20	0.5	-0.7
25	1.0	-0.4
30	0.8	-0.6
35	1.1	-0.4
40	1.6	-0.1
45	1.7	-0.2
50	2.0	-0.1
55	2.5	-0.1
60	3.2	0.0

PARASITIC LOSS CURVE FIT r-SQRD: 0.986

LOSS CURVE COEFFICIENTS:

a: -0.87 LBS
b: 0.047 LBS/MPH
c: -0.000016 LB/MPH2
d: 0.000016 LB/MPH3

MAX BEARING MOTOR SPEED: 100.000 MPH
BEARING LOSSES OFFSET: 0.000 LBS

Attachment H Continued

HORIBA ELECTRIC DYNAMOMETER
CDC-900
DYNAMOMETER REPORT

TEST SITE: DOO5
ARCHIVE REC: 9999
TEST NUMBER: 95 9999
VIN:
OPERATOR: 42044

END DATE: Mar 29 1995
END TIME: 20:39:20
TIME STARTED: 20:14:20

COMMENT:

DIRECTION: FORWARD
AUGMENTED BRAKING: OFF
GRADE: OFF

INERTIA: 3625 LBS

ROAD LOAD: 8.60 HP@50
A: 3.87 LBS
B: -0.0028 LB/MPH
C: 0.02430 LB/MPH2

DISTANCE TRAVELED: 3.920 MILES

ENERGY TRANSFERRED FROM VEHICLE: 3722.3 HP-S
ENERGY TRANSFERRED TO VEHICLE: 2130.8 HP-S

AVERAGE POSITIVE ERROR: 0.02 %
AVERAGE NEGATIVE ERROR: -0.02 %

F O R C E E R R O R S T A T I S T I C S

SPEED RANGE MPH	NUM PTS	MINIMUM LBS	MAXIMUM LBS	AVERAGE LBS	STD DEV LBS
5.-.15	24	-3.960	2.463	-0.947	1.633
15.-.25	156	-7.429	3.106	0.013	1.316
25.-.35	132	-3.725	5.102	0.063	0.990
35.-.45	18	-1.813	3.891	0.142	1.460
45.-.55	83	-1.250	1.243	-0.075	0.533
55.-.65	34	-0.734	0.646	0.112	0.290
65.-.75	0	0.000	0.000	0.000	0.000
75.-.MAX	0	0.000	0.000	0.000	0.999

PARASITIC LOSSES RECORD: 217
LOSS CURVE COEFFICIENTS:
a: -0.249 LBS
b: 0.020 LB/MPH
c: 0.000478 LB/MPH2
d: 0.000001 LB/MPH3

Attachment I
UDDS Specifications

The operator will follow the driving schedule trace as closely as possible, using the minimum accelerator pedal movement necessary to maintain the required speed, and he/she may use the choke, accelerator pedal, etc., where necessary to keep the engine running.

Accelerations shall be driven smoothly and deceleration modes shall be run in gear using the brakes or accelerator pedal as necessary to maintain the desired speed. The upper speed tolerance at any given time for the UDDS is 2 mph higher than the highest point on the trace within 1 second of the given time. The lower speed tolerance at any given time for the UDDS is 2 mph lower than the lowest point on the trace within 1 second of the given time. Speed variations greater than the tolerances (such as may occur during gear changes) are acceptable provided they are less than 2 seconds in duration. Acceptable speed variations may occur during gear changes, brake spikes, engine stumbling, etc. Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power (MAP) during such occurrences.

If a vehicle fails to achieve the required acceleration rate under wide open throttle (WOT) during the UDDS, the test will be completed and the senior technician and a Certification Division (CD) Representative or EPA Task Officer will be notified. The CD representative or EPA Task Officer will then determine the acceptability of the shift schedule.

If the vehicle has an automatic transmission, idle modes shall be run with the automatic transmission in drive and the brakes applied.

If the vehicle has a manual transmission, shift the gears at the points specified on the driving schedule. In cases where the manufacturer recommends special shift points or use of a shift indicator light, an appropriate VDA driving schedule will be provided with the special shift points indicated. The operator shall release the accelerator pedal during each shift and accomplish the shift in the minimum necessary time. For those modes which decelerate to zero, manual transmission clutches shall be depressed when the speed drops below 15 mph, when engine roughness is evident, when engine stalling is imminent, or where noted on special shift schedules. Optional downshifts (the 187-second point and 840-second point on the driver's trace) are made only at the manufacturer's request or to prevent lugging or stalling. Idle modes shall be run with the transmission in gear and the clutch disengaged, except for the first idle.

If the engine stalls during an idle period (other than initial idle), the engine shall be restarted immediately and the test continued. If the engine cannot be restarted before the next acceleration, immediately stop the VDA trace by pressing <Command-Space Bar> and restart the engine. If the engine starts, accelerate the vehicle to required point on the VDA trace and immediately restart scrolling of the VDA trace by pressing <Command-S>.

If the engine stalls during some operating mode other than idle, immediately stop the VDA trace scrolling by pressing <Command-Space Bar> (it is not necessary to bring the drive wheels to a stop). The vehicle shall then be restarted and accelerated to the speed required at that point in the driving schedule. During acceleration to this point, shifting shall be performed in accordance with CFR 86.128. When the vehicle reaches the required point on the VDA trace, immediately restart scrolling of the VDA trace by pressing <Command-S>. If the vehicle does not restart immediately, attempt to restart the vehicle, cranking for 10 seconds and pausing for 10 seconds, for up to 1 minute. If the vehicle will not restart within 1 minute, notify the senior technician. Make no further attempts to restart the vehicle. The test shall be void, the vehicle removed from the dynamometer. Complete Form 902-01, obtain all approval signatures, and file with the data processor.

Attachment J

Highway Fuel Economy Test

The following steps are for the HFET. Start the test vehicle's engine according to the manufacturer's recommended starting procedures. If the test vehicle is in the Recall program, start the engine according to the technical directive. Follow the instructions in the control dialogue box at the bottom of the screen.

If the vehicle engine starts and continues to run, start the VDA trace scrolling by pressing <Command-S>, following the instructions at the bottom of the screen.

If you need to stop, select the "Kill" button by pressing <Command-K>. To resume the procedure, position the mouse pointer on "Test." Press and hold down the mouse button and pull down the "Test" Menu. Position the pointer on the "Rewind" menu item and release the mouse button to select it.

To start scrolling, simultaneously press <Command-S> and crank the engine. The crank time will be displayed on the left side of the control dialog box. See Figure 1.

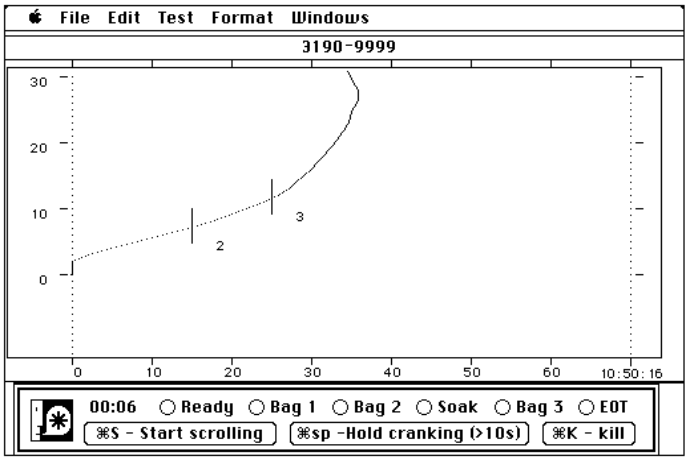


Figure 1

If the key has not been turned to the start position and you need to stop, select the "Kill" button by pressing <Command-K>. To resume the procedure, position the mouse pointer on "Test." Press and hold down the mouse button and pull down the "Test" Menu. Position the pointer on the "Rewind" menu item and release the mouse button to select it .

If the vehicle does not start after 10 seconds of cranking, the cranking shall cease and the reason for failure to start shall be determined. Select the "Hold cranking > 10 sec." button at the bottom of the screen by pressing <Command-Space Bar>.

Attachment J Continued

Second start attempt, see Step 406 in the test procedure.

Start the test vehicle's engine according to the manufacturer's recommended starting procedures. If the test vehicle is in the Recall program, start the engine according to the technical directive. Follow the instructions in the control dialogue box at the bottom of the screen. To start scrolling, simultaneously press <Command-S> and crank the engine.

If the engine false starts, see Step 409 in the test procedure.

Operate the test vehicle for one preconditioning EPA Highway Fuel Economy Driving Schedule (HFEDS). See TP 703 for driving techniques to be followed during the vehicle preconditioning.

Before driving the test vehicle on the 48" single-roll electric dynamometer, ensure that it is in the "RUN MODE" and the contact has been engaged.

If at any time during the driving of the HFEDS a condition occurs that requires the driver to add a comment, press <~>. This will flag the data for entry of a comment at a time convenient for the driver.

If the vehicle is driven at wide open throttle (WOT), indicate all places where this occurs on the VDA trace. See Section 600, Editing Driving Events for instructions.

At the 780-second point of the HFET, 2 seconds before the beginning of the first acceleration, the VDA will automatically start sampling Operate the test vehicle for one EPA Highway Fuel Economy Driving Schedule (HFEDS).

If the vehicle stalls during the sample collection of the HFEDS, the test is void.

If problems occur before the end of the test (1545 seconds), the HFEDS may be stopped by selecting <Command-Space Bar> and corrective action taken. The sample bags must be evacuated, purged, and evacuated again and the roll revolution counter must be reset.

If the test is to be set up again prior to the 780 second point of the trace, and the CVS has not been sampling, purging and evacuating are not required.

The previous test data have not been saved and the HFEDS may then be restarted. To restart the VDA video strip chart at the beginning, position the pointer on the "Re-set up Test" button in the control dialog box and click on it.

If the engine is running, do not attempt to start it again. The final VDA Summary Report will show that the test had been set up again, thus documenting the corrective action taken.

The test number may be reused. The bags must be evacuated, purged, and evacuated again unless another set of bags is used.

Attachment J Continued

At the 1545-second point of the HFEDS, 2 seconds after the end of the deceleration to zero, the VDA will automatically switch off the sample bag. The "EOT" indicator will come on. The vehicle engine must be running.

Within 1 minute following completion of the HFEDS, the driver must perform a Quick Check Coastdown, if required (TP 712). When the Quick Check Coastdown is completed, turn off the CVS blower.

Go to Section 400 for details on vehicle removal from the electric dyno.

These criteria must be met for the HFET to be valid:

Ambient temperatures encountered by the test vehicle must remain within 68-86 ^{o}F at all times.

The sample VDA trace must be within the following HFEDS speed tolerances:

The upper limit speed tolerance for the HFEDS preconditioning cycle trace is 4 mph higher than the highest point on the trace within 1 second of the given time. The lower limit is 4 mph lower than the lowest point on the trace within 1 second of the given time.

The upper limit for the HFEDS test cycle trace is 2 mph higher than the highest point on the trace within 1 second of the given time. The lower limit is 2 mph lower than the lowest point on the trace within 1 second of the given time.

Speed variations greater than the tolerances (such as may occur during gear changes, etc.) are acceptable provided they occur for less than 2 seconds on any occasion.

Acceptable speed variations may occur during gear changes, brake spikes, engine stumbling, etc.

Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences.

The dynamometer inertia simulation must be set to the exact inertia value specified for the vehicle on the "Vehicle Specification Report."

The 48" single-roll electric dynamometer must be set to the correct inertia and A, B, and C coefficients.

The 48" single-roll electric dynamometer average positive simulation error must be less than 0.05% and the average negative simulation error must be less than -0.05%.

The dynamometer must be warmed according to CFR 86.135.

Attachment K

HFET Video Drivers Aid Report

```
**********************************************************************************
*  VIDEO DRIVER'S AID TEST REPORT (1.22b3)                    Page  1 of  3  *
*  0195^0000                                    Processed: 08:13:50 01/30/95  *
**********************************************************************************

   -- Test and Vehicle Information --
Test Sch:  0195^0000                          Mfr:
Shift Sch: A260-0069                          Veh ID:
Drive Sch: HWFE(Cert)                         Version:     02
Test Type: 01                                 Eq Test Wgt:3500
Test Proc: 03                                 Ind HP:      6.3
Driver ID: 42131                              Dyno Site:   D001
Key Start: 09:21:47 12/30/94

   -- Test Control Events --
         clock             event
trace    time    test      time     CVS
time     stamp   control   seconds  status
------ -------- -------- ------- --------
    .0           SETUP
    .0 09:21:38 CVSWAIT1     4.4 EOT
    .0 09:21:43 READY        4.4 RDY
    .0 09:21:47 STARTUP       .7 RDY
    .0 09:21:48 DRIVE       780.0 RDY
 780.0 09:34:48 DRIVE       765.0 BAG 1
1545.0 09:47:33 FINISHED      .1 EOT

                                                    -- Out of Tolerance Data --
   -- Comments --                                     last   back          max
 trace                                              in tol in tol secs    mph
 time    comments                                   @trace @trace  out    out
------ ---------------------------------------- ------ ------ -----  -----



I have validated the data in accordance with the requirements of TP 710.

Technician ID#:_____     Date:_____

tol is +/-4 mph from times     .0 to  780.0 per EPCN 33
tol is +/-2 mph from times  780.0 to 1545.0 per CFR 600.109-78(b)(2)
```

Attachment L

FTP Video Drivers Aid Report

```
**********************************************************************************
*  VIDEO DRIVER'S AID TEST REPORT (1.22b3)                    Page  1 of  4  *
*  0195^0000                                  Processed: 08:11:34 01/30/95  *
**********************************************************************************

   -- Test and Vehicle Information --
Test Sch:  0195^0000                        Mfr:
Shift Sch: A474-0001                        Veh ID:
Drive Sch: FTP(Cert)                        Version:     00
Test Type: 01                               Eq Test Wgt:3875
Test Proc: 02                               Ind HP:      7.5
Driver ID: 42145                            Dyno Site:   d001
Key Start: 07:22:33 11/33/94

   -- Test Control Events --
        clock             event
trace    time    test     time     CVS
time     stamp  control  seconds  status
------ -------- -------- ------- --------
    .0          SETUP
    .0 07:21:48 CVSWAIT1     2.9 EOT
    .0 07:21:51 READY       42.1 RDY
    .0 07:22:33 STARTUP      2.6 BAG 1
    .0 07:22:36 DRIVE      505.0 BAG 1
 505.0 07:31:01 DRIVE      864.0 BAG 2
1369.0 07:45:25 SHUTDOWN     1.8 BAG 2
1369.0 07:45:27 DELAY        5.0 BAG 2
1369.0 07:45:32 HOT SOAK   540.0 SOAK
1369.0 07:54:32 CVSWAIT2     2.7 SOAK
1369.0 07:54:35 READY       34.4 SOAK
1369.0 07:55:09 STARTUP      2.7 BAG 3
1369.0 07:55:12 DRIVE      505.0 BAG 3
1874.0 08:03:37 FINISHED      .1 EOT

                                                    -- Out of Tolerance Data --
   -- Comments --                                     last   back          max
 trace                                              in tol in tol secs    mph
 time    comments                                   @trace @trace  out    out
------ ---------------------------------------- ------ ------ -----  -----
 121.2 brakes                                      121.1  126.4   5.3    2.0
 396.7 brakes                                      396.6  396.8    .2     .0
 396.9 brakes                                      396.8  397.1    .3     .0
1794.7 brakes                                     1794.6 1794.8    .2     .0
1853.9 over accel                                 1853.8 1854.1    .3     .1

 I started and drove this vehicle in accordance with the requirements of TP 707.

 Technician ID#:_____________________________     Date:_____________________

 I have validated the data in accordance with the requirements of TP 707.

 Technician ID#:_____________________________     Date:_____________________

 test tolerance is +/- 2 mph per CFR 86.115-78(b)(1)(i,ii)
```

Attachment M

Preliminary Laboratory Report

Test Information:

Run Number:	8	Vehicle Make:	
Test Date:	6-Nov-98	Engine Number:	wh123456
Test Time:	14:28:35	Road Load Power:	7.5 hp
Test Type	EPA75	Inertia:	2500 lbm
Requester:	EPA	Shift Point Ph1,2	
Operator:	Ben Haynes	Shift Point Ph3	
Driver:	Ben Haynes	Transmission:	manual
Fuel Type:	Indolene	Odometer	197.9 mi
Fuel System:	MP9.0	Driver Errors:	0
Remarks:	dummy test		
Remarks:	remark2		

Test Conditions	Phase 1	Phase 2	Phase 3
Test Time (sec):	506.8	867.4	509.4
Avg. Cell Temp.(degF)	75	75.8	75.1
Avg. CVS Flow Rate (SCFM)	332.5	330.8	331.4
CVS Volume (SCF, 20degC)	2808.7	4757.6	2813.9
Dilution factor:	12.682	19.467	12.956
Bag Analysis Time (sec):	391	401	400
Driver Out of Limits (sec):	20.8	-16.4	0
Distance (mi)	3.568	3.874	3.583
Crank Time (sec):	2		4.6
Hold Time (sec):	0	0	0
Barometer (inHg)	29.1	29.1	29.2
Dew Point (degF)	47	47	46.8
Rel. Humidity(%):	37.1	36.1	36.5
Specific Humidity (grain/lbm)	48.914	48.962	48.464
Hum Corr Factor:	0.8909	0.8911	0.8892

Bag Results	THC	CO	NOx	CO2	CH4
Phase 1	(ppm)	(ppm)	(ppm)	(%)	(ppm)
Sample:	71.341	257.236	72.099	1.024	5.016
Ambient:	7.459	0.192	0.314	0.044	1.686
Net Concentration:	64.47	257.059	71.809	0.983	3.464
Phase 2					3.341
Sample:	37.8	106.753	21.719	0.674	1.68
Ambient:	9.045	-0.144	0.17	0.043	1.747
Net Concentration:	29.22	106.889	21.558	0.633	1.747
Phase 3					4.84
Sample:	60.381	203.096	64.233	1.008	1.697
Ambient:	8.043	-0.069	0.187	0.04	3.274
Net Concentration:	52.958	203.16	64.061	0.971	3.274

Mass Results (gm/ mi)	THC	CO	NOx	CO2	CH4
Phase 1	0.829	6.67	2.728	401.188	0.051
Phase 2	0.586	4.326	1.278	403.019	0.041
Phase 3	0.679	5.26	2.424	395.095	0.049
Weighted (Phase1,2,3)	0.66	5.07	1.89	400.47	0.04

Fuel Economy (mi/gal)	
Phase 1	21.4
Phase 2	21.53
Phase 3	21.86
Weighted (Phase1,2,3)	21.59